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POLLUTION OF THE NAVIGABLE WATERS OF THE DETROIT RIVER AND LAKE ERIE AND THEIR TRIBUTARIES WITHIN THE STATE OF MICHIGAN

SESSION (1ST) HELD AT DETROIT, MICHIGAN ON MARCH 27-28, 1962. VOLUME I. TRANSCRIPT OF CONFERENCE

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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TRANSCRIPT OF CONFERENCE
IN THE MATTER OF

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POLLUTION *of the* NAVIGABLE WATERS *of the* DETROIT RIVER *and* LAKE ERIE *and* THEIR TRIBUTARIES WITHIN *the* STATE *of* MICHIGAN

First Session
March 27-28, 1962
Detroit, Michigan

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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JOINT FEDERAL-STATE OF MICHIGAN CONFERENCE
ON
POLLUTION OF NAVIGABLE WATERS OF THE DETROIT RIVER, LAKE ERIE, AND THEIR TRIBUTARIES WITHIN THE STATE OF MICHIGAN

First Session
Tuesday, March 27, 1962

Banquet Hall, Veterans Memorial Building
Detroit, Michigan

Volume I

Pages 1 through 177

CONTENTS

STATEMENT OF: PAGE:

MURRAY STEIN, The Chairman 3
JOHN D. DINGELL, Congressman 8
H. W. POSTON, Conferee, Regional Program Director, Water Supply and Pollution Control, Public Health Service Region V Chicago, Illinois, Department of Health, Education, and Welfare 8-D

JOHN M. RADEMACHER, Senior Sanitary Engineer, United States Public Health Service, Region V, Chicago, Illinois -- Report on "Pollution of Waters of the United States in Lake St. Clair, the Detroit River, and Western Lake Erie in the Detroit Area." 14

F. W. KITTRELL, In Charge of Pollution, United States Public Health Service, Robert A. Taft Engineering Center, Cincinnati. 46

F. W. KITTRELL, Further Statement 70

HAROLD F. CLARK, Bacteriologist, Research Branch, Division of Water Supply and Pollution Control 105
COL. R. C. PFEIL, U.S. Corps of Engineers 110
ROBERT F. RITZENHEIN, Assistant United States Attorney, representing Lawrence Gubow, United States Attorney for the Eastern District of Michigan 125

WARREN H. NORD, Supervisor, Branch of River Basin Studies, Bureau of Sport Fisheries and Wildlife, Department of Interior 131

W. F. CARBINE, Regional Director, Great Lakes-Central Region, Bureau of Commercial Fisheries, U. S. Department of the Interior 142

COMMANDER F. M. FISHER, Jr., United States Coast Guard. 155

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CONTENTS

STATEMENT OF: PAGE:

CARL R. MILLER, Director, United States Department of Agriculture Sedimentation Laboratory, Southern Branch, Soil and Water Conservation Research Service, Agricultural Research Service, United States Department of Agriculture, Oxford, Mississippi 165

DONALD G. EDDY, Executive Office of the President, Office Of Emergency Planning 173

SUMMARY OF CONFERENCE
(FIRST SESSION)

POLLUTION OF NAVIGABLE WATERS
DETROIT RIVER AND LAKE ERIE
(MICHIGAN)

MARCH 27 and 28, 1962

The waters considered at this Conference are those within the State of Michigan which extend from the mouth of the south channel of the St. Clair River around the western side of Lake St. Clair, down the Detroit River and along the extreme western end of Lake Erie to the Michigan-Ohio State line, and all tributary waters within the area described. Lake St. Clair and the Detroit River constitute the connecting channel between the Upper Great Lakes and Lake Erie. Four Michigan counties, St. Clair, Macomb, Wayne and Monroe, front on the waters involved. Detroit, the nation's fifth largest city, and the adjacent complex discharge their wastes, industrial and municipal, to the waters involved.

On the basis of a written request to the Secretary of Health, Education, and Welfare from the Honorable John B. Swainson, Governor of Michigan, dated December 6, 1961, the Secretary of Health, Education, and Welfare on January 19, 1962 called a conference under the provisions of section 8 of the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.) in the Matter of Pollution of the Navigable Waters of the Detroit River and its tributaries within the State of Michigan, and Lake Erie and its tributaries within the State of Michigan. The first session of the Conference was held on March 27 and 28, 1962, in the Veteran's Memorial Building, Detroit, Michigan.

The following conferees representing the Michigan Water Resources Commission and the U.S. Department of Health, Education, and Welfare, participated in the Conference:

Albert E. Heustis, M.D.	Michigan Water Resources Commission Lansing, Michigan
Gerald E. Eddy	Michigan Water Resources Commission Lansing, Michigan
George F. Liddle	Michigan Water Resources Commission Muskegon, Michigan
James S. Gilmore, Jr.	Michigan Water Resources Commission Kalamazoo, Michigan
H. W. Poston	U.S. Department of Health, Education, & Welfare Chicago, Illinois
Murray Stein, Chairman	U.S. Department of Health, Education, & Welfare Washington, D.C.

Also participating in the Conference were the following:

Robert E. Teifer	Mayor City of Trenton Trenton, Michigan
Milton P. Adams	Michigan Water Resources Commission Lansing, Michigan
C. D. Barrett, M.D.	Monroe County Health Department Monroe, Michigan
George R. Bingham	Wayne County Department of Public Works Detroit, Michigan
Laurence M. Braun	Anti-Pollution Committee Wayne County Sportsmens Club Detroit, Michigan
David Calhoune	Wayne County Supervisors Inter-County Committee Detroit, Michigan

W. F. Carbine	U.S. Bureau of Commercial Fisheries Ann Arbor, Michigan
John Chascsa	Lake Erie Cleanup Committee Estral Beach Newport, Michigan
Harold F. Clark	U.S. Department of Health, Education, & Welfare Cincinnati, Ohio
Frank E. Clarke	U.S. Geological Survey Washington, D.C.
Richard Daughtery	Wayne County Drain Commission Detroit, Michigan
James M. Davey	Wayne County Road Commission Detroit, Michigan
Donald Eddy	U.S. Office of Emergency Planning Battle Creek, Michigan
Arthur C. Elmer	Michigan Department of Conservation & Parks Lansing, Michigan
Cmdr. Frank M. Fisher, Jr.	U.S. Coast Guard Cleveland, Ohio
George Hazey	Wyandotte Water Division Wyandotte, Michigan
Darwin R. Kirk	Van Buren Township Wayne County
F. W. Kittrell	U.S. Department of Health, Education, & Welfare Cincinnati, Ohio
Edward Mallonen	Huron-Clinton Metropolitan Authority Detroit, Michigan
Carl R. Miller	U.S. Department of Agriculture University, Mississippi
Herbert J. Miller	Michigan Department of Conservation & Parks Lansing, Michigan

Gerald Murphy	The Detroit Edison Co. Detroit, Michigan
Warren H. Nord	U.S. Bureau of Sport Fisheries & Wildlife Minneapolis, Minnesota
Loring F. Oeming	Michigan Water Resources Commission Lansing, Michigan
Nicholas V. Olds	Assistant Attorney General State of Michigan Lansing, Michigan
Clyde L. Palmer	Detroit Department of Public Works Detroit, Michigan
Col. R. C. Pfeil	U.S. Corps of Engineers Detroit, Michigan
William J. Phelan	Monroe County Rod & Gun Club Monroe, Michigan
Donald M. Pierce	Michigan Department of Health Lansing, Michigan
Joseph W. Price	Washtenaw County Health Department Ann Arbor, Michigan
John M. Rademacher	U.S. Department of Health, Education, & Welfare Chicago, Illinois
Paul M. Reid	Detroit Metropolitan Area Regional Planning Commission Detroit, Michigan
Gerald Remus	Detroit Water Department Detroit, Michigan
Glenn C. Richards	Detroit Department of Public Works Detroit, Michigan
D. W. Ringler	Oakland County Department of Public Works Pontiac, Michigan
Robert Ritzenheim	U.S. Department of Justice Detroit, Michigan

John E. Vogt	Michigan Department of Health Lansing, Michigan
Keith Wilson	Michigan Waterways Commission Detroit, Michigan

The Chairman of the Conference pointed out that:

1. Under the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.) pollution of navigable waters which endangers the health or welfare of any persons is subject to abatement under procedures prescribed by section 8 of the Federal Act.

2. The first step of this procedure is the calling of a conference.

3. The purpose of the conference is to bring representatives of the State and the U.S. Department of Health, Education, and Welfare together to review the existing situation and progress made; to lay a basis for future action by all parties concerned; and, to give the State and localities an opportunity to take any remedial action under State and local law which may be indicated.

In the light of conference discussion, the conferees unanimously agreed to the following conclusions and recommendations:

1. Lake St. Clair, the Detroit River, and Lake Erie, within the State of Michigan, and their tributaries within the State of Michigan, are navigable waters within the meaning of section 8 of the Federal Water Pollution Control Act.

2. Pollution of navigable waters subject to abatement under the Federal Water Pollution Control Act is occurring in the Michigan waters of Lake St. Clair, the Detroit River, and Lake Erie, and their tributaries. The discharges causing and contributing to the pollution come from various industrial and municipal sources.

3. This pollution causes deleterious conditions so as to interfere with legitimate water uses, including municipal and industrial water supplies, fisheries resources, commercial and sport fishing, swimming, water skiing, pleasure boating and other forms of recreation.

4. It is too early, on the basis of the record of the Conference, to make an adequate judgement of the adequacy of the measures taken toward abatement of the pollution. The Conference discussions demonstrate that there are many gaps in our knowledge of sources of pollution and their effects.

5. Cognizance is taken of the program of the Michigan Water Resources Commission for development of adequate pollution control measures on a progressive basis and the excellent progress being made by many municipalities and industries under this program. Delays encountered in abating the pollution may well be caused by the existence of a municipal and industrial complex concentrated in an area with a limited water resource. The conferees are also aware of the vast problems that Detroit faces as a result of the storm water outflow from a system of combined sewers. The problem thus becomes one of approaching the entire area on a coordinated basis and putting in adequate facilities based on an overall plan.

6. Cognizance is also taken of the six-county study as a useful apprach to the solution of the pollution problem in the Detroit area.

7. The Department of Health, Education, and Welfare, in order to close the gaps in the knowledge as to sources of pollution, nature of pollution, and the effects thereof, appropriate methods of abatement, and appropriate methods to avoid delays in abatement, will initiate an investigation and study to gather data and information on the waters involved. This investigation and study will be carried on in close cooperation with the State

agencies concerned, with the details of the investigation to be determined by the technical staffs of the Department of Health, Education, and Welfare, the Michigan Health Department and the Michigan Water Resources Commission. The Department of Health, Education, and Welfare will establish a resident survey group to provide technical assistance for this investigation.

8. The Department of Health, Education, and Welfare will prepare reports on the progress of this investigation at six month intervals which will be made available to the Michigan Water Resources Commission. The Michigan Water Resources Commission will make information contained in these reports available to all interested parties.

9. The Conference will be reconvened at the call of the Chairman with the concurrence of the Michigan Water Resources Commission to consider the results obtained from the investigation and study, and to agree on action to be taken to abate pollution

Conference in the Matter of Pollution of the Navigable Waters of the Detroit River and its Tributaries within the State of Michigan, and Lake Erie and its Tributaries within the State of Michigan, at 10 a.m., Eastern Standard Time, March 27, 1962, Banquet Hall, Veteran's Memorial Building, Detroit, Michigan.

PRESIDING:

Mr. Murray Stein, Chief, Enforcement Branch, Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare, Washington, 25, D. C.

PRESENT:

Mr. Murray Stein, Chief, Enforcement Branch, Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

MICHIGAN WATER RESOURCES COMMISSION

Albert E. Heustis, M.D., Chairman, State Health Commissioner.

Gerald E. Eddy, Director of Conservation.

George F. Liddle, Muskegon, Municipal Groups.

James S. Gilmore, Jr., Kalamazoo, Industrial Management Groups

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

H. W. Poston, Regional Program Director, Water Supply and Pollution Control, Public Health Service, Region V, 433 West Van Buren Street, Chicago 7, Illinois.

PROCEEDINGS

OPENING STATEMENT OF THE CHAIRMAN

THE CHAIRMAN: The conference is open. This conference is being held under Section 8 of the Federal Water Pollution Control Act. Under the terms of the Act the Secretary of Health, Education, and Welfare is authorized to call a conference of this type when requested to do so by the Governor of a State.

In a letter dated December 6, 1961, to the Honorable Abraham Ribicoff, Secretary of Health, Education, and Welfare, Governor John B. Swainson of Michigan made such a request. Secretary Ribicoff answered this by letter to Governor Swainson on December 19, 1961, and said he was most happy to comply with his request and, in accordance with the terms of the law a notice of the conference was sent to the officials of the Michigan Water Resources Commission on January 19, 1962.

Under the terms of this notice the conference covers all the navigable waters of the Detroit River and its tributaries within the State of Michigan, and Lake Erie and its tributaries within the State of Michigan. The waters and sources of pollution covered by the conference, of course, are limited to those within the United States.

The purpose of the conference is to bring together representatives of the State and Federal Government and other interested parties to review the situation, the progress which has been made, and to lay a basis for any further indicated action by all parties concerned; and, to give the states, localities, and industries an opportunity to take any indicated remedial action under state and local law.

In accordance with the terms of the Federal Water Pollution Control Act this is a conference between the official state water pollution control agency of Michigan and representatives of the Federal Government. For the purposes of the Federal Act the official state water pollution control agency of Michigan is the Michigan Water Resources Commission. The State, of course, may bring anyone it wishes to the conference and have these people participate in the conference.

The State of Michigan has designated as its conferees for the conference Dr. Albert E. Heustis, State Health Commissioner, Mr. Gerald E. Eddy, Director of Conservation, Mr. George F. Liddle of Muskegon, for Municipal Groups, and Mr. James S. Gilmore, Jr., of Kalamazoo, for Industrial Management Groups.

On my right is Mr. H. W. Poston, Regional Program Director for the Public Health Service with headquarters in Chicago, and my name is Murray Stein. I am from the

Department of Health, Education, and Welfare, with headquarters in Washington, D. C.

Now, the conference technique, as you know, has been a tried and proven technique. In many of the states the conference is used informally in its day to day business. I think in the development of the Federal Water Pollution Control Act this conference technique was placed in the statute for the first time. However, this is not a new idea. As long ago as 1921 the United States Supreme Court in considering the famous pollution case of New York and New Jersey said, and I quote here: "We cannot withhold the suggestion inspired by the consideration of this case, that the grave problems of sewage disposal presented by the large and growing population living on the shores of New York Bay is one more likely to be wisely solved by cooperative study and by conference and mutual concession on the part of representatives of the states so vitally interested in it than by proceedings in any court, however constituted."

I think that is the attitude that we hope all parties will approach the conference technique today with, namely, that we are here to try to do what we can to help the situation.

Both the state and the Federal Government, as you know, have responsibility in dealing with water pollution problems. The Federal Water Pollution Control Act declares that the primary responsibilities and rights for controlling water pollution rest with the state. Consistent with this, we are charged by law to encourage state action to abate pollution of navigable waters. However, the Secretary of Health, Education, and Welfare also is charged by law with specific responsibilities in the field of water pollution control, as pollution of navigable waters which endangers health or welfare of any person is subject to abatement in accordance with the provisions of the Federal Act. In accordance with the terms of this Federal Act at the conclusion of the conference we are required to prepare a summary of the conference discussions and furnish copies to the official state water pollution control agency attendant. This summary must cover the following points:

1. Occurrence of pollution in navigable waters subject to abatement under the Federal Act;

2. The adequacy of measures taken for abatement of pollution; and,

3. The nature of delays, if any, being encountered in abating the pollution.

In order to help us provide a serviceable summary we suggest the conference discussions be directed towards covering these points: The conference conclusions and recommendations will be based solely on the material presented in this record. A word about the procedure governing the conference. Mr. Jack Rund, an expert court stenographer, is making a verbatim report of the conference, so we will have a complete record of what is said and done here. The conference summary and the verbatim report will be made available to interested parties through your state agency. We would suggest that all interested parties who wish a copy of the summary or the transcript, after the conference get in touch with the Michigan Water Resources Commission officials. We have found this a much better way of dealing with the situation since it preserves the normal relationships of cities, people, and industry in the state in dealing with the state agencies rather than directly with the Federal Government in cases of this kind, and this is the way it should be done.

What we are going to do is call upon each of the conferees to make a statement and have the conferees call their invitees and have them make a statement too. At the conclusion of these statements the conferees may comment or ask questions and at the conclusion of these I may ask a question or two also, and perhaps have a comment.

We have found by experience that this provides an orderly procedure in developing information and in arriving at equitable conclusions and solutions.

It is suggested that any participant in the conference come up to the lectern and speak from there; that you identify yourself by name and affiliation rather clearly for the purpose of the record; and, if you have a prepared statement, please give it to the stenographer at that time. It becomes quite a chore to handle this during a long day's session and it will be most appreciated if the stenographer can have a copy of your prepared statement.

At this point we will receive Congressman Dingell's statement.

STATEMENT OF CONGRESSMAN JOHN D. DINGELL
OF THE FIFTEENTH DISTRICT OF MICHIGAN

"I am anxious to submit a statement in connection with this Conference as the elected Representative of the citizens of my district, in whose welfare I am keenly interested. In my service in the Congress, first on the Public Works Committee and presently on the Merchant Marine and Fisheries Committee, I have had the opportunity to learn the alarming facts in regard to the widespread abuse of our precious water resources. Consequently, I have devoted my efforts toward the protection and conservation of this invaluable resource and I pride myself on having had a share in the successful enactment of the Federal Water Pollution Control Act, Public Law 660 of the 84th Congress, and on being a co-author and co-sponsor of the Blatnik-Smith-Dingell Bill of this Congress, under provisions of which this Conference is called. I am, therefore, greatly interested in the practical administration of the programs authorized under this Act.

"These two interests are mutually complementary. I cannot conceive of a more important service that I may render to my constituents than to assure for them the benefits of an adequate supply of good quality water.

"Michigan has long been known as a Water Wonderland. We have justifiably extolled the beauty of our lakes and streams far beyond our great State's borders. We have attracted multitudes of our fellow Americans with the promise of the enjoyments and delights to be pursued in our out-of-doors. Some of my happiest days as boy and man have been spent in or on our plentiful waters.

"I have listened, however, with great dismay to the reports of my conservationist friends as to the condition of the Nation's rivers and streams, including our own. In their company, I have personally travelled over these same waters and been profoundly shocked at the utter disregard and neglect with which we are defiling our national heritage. This is indeed a shameful commentary on our national life and I refuse to accept that this is the price we must pay for the trappings and luxuries of our modern-day technological progress.

"I have been more than gravely concerned about the existing conditions of the waters of the Detroit River.

The indicators marking the unhealthy status of the river are unmistakeable and made all too evident by the enforced closing of our beaches, the dreadful toll of wildlife resulting from at least two major kills, and the dangerously mounting coliform bacteria counts revealed in water samplings. I add to this the numerous and increasing complaints which I receive from householders and property owners in our neighboring downstream communities, who are deprived of their rightful use and enjoyment of these waters and alarmed at the threats to their health and property.

"Encouraging corrective results have already been demonstrated in other areas by the application of the provisions of the Federal Water Pollution Control Act. A striking case-in-point is that of Sioux City, Iowa. A conference similar to this one, involving interstate pollution of the waters of the Missouri River, was held in June 1958. The lack of progress in instituting remedial measures following the conference necessitated a public hearing, which is the second stage of the enforcement procedures provided by the Act. The hearing was held in April 1959 and was vigorously opposed by Sioux City officials. This leads me to my punch line. Among the 1962 selections of the National Municipal League and Look Magazine, Sioux City, Iowa has been awarded a citation as an All-American City. Importantly mentioned in Sioux City's citation is a new sewage disposal plant - the $7 million plant that was shown to be necessary by the enforcement action taken against the City. All during the enforcement proceedings, the City claimed that her industries would be driven away by the high costs involved in providing adequate waste treatment. Today, Sioux City is proud to boast that within the past 3 years, 45 manufacturers have expanded their operations and in addition 10 new industries have been welcomed to its business community.

"In no proceeding of this sort have the entrenched forces of polluters and spoilers failed to engage in well financed and ruthless campaigns to halt, discredit and misdirect clean up activities. Neither our citizens nor I will stand for such activities and I warn all who seek to prevent a fair hearing or a complete and fair clean up that their efforts will be exposed to the light of public displeasure and criticism.

"I know that the objectives of the conference today are to inquire closely as to whether there is pollution of our waters, and, if so, to determine the steps that need to be taken to abate such pollution. Certainly, the make-up of the conference instill me with every confidence that this matter will be most fairly and judiciously dealt with. Our local and State authorities are joined cooperatively with the Federal Government toward this end. I commend our

Governor, the Honorable John B. Swainson, and the Secretary of Health, Education, and Welfare, the Honorable Abraham Ribicoff, and all of the participants here convened, who are taking this course to protect the health and welfare of our people."

THE CHAIRMAN: With that, we would like to call on Mr. H. W. Poston for the Public Health Service statement. Mr. Poston.

STATEMENT OF H. W. POSTON, CONFEREE,
REGIONAL PROGRAM DIRECTOR, WATER SUPPLY
AND POLLUTION CONTROL, PUBLIC HEALTH
SERVICE REGION V, CHICAGO, ILLINOIS,
DEPARTMENT OF HEALTH, EDUCATION,
AND WELFARE

MR. POSTON: Thank you, Mr. Stein. Conferees and ladies and gentlemen. It is a privilege to be here today as a conferee. I think this conference will be beneficial in the way of preserving a most valuable water resource in one of our country's largest metropolitan areas. We can promote the widest use and reuse of this greatest natural resource as opposed to its abuse.

Your Federal Government is not new in this field of water quality control. This conference today is only one of many efforts in this vital field. The Congress of our United States has shown its great concern in these matters by the passage of a Water Pollution Control Act in 1948. Then it emphasized this concern in these important matters by strengthening this Act first in 1956 and then again in 1961.

The Public Health Service, in carrying out the provisions of the Water Pollution Control Act, have a program which may be divided into four parts. They are, generally, (1) grants, (2) research, (3) comprehensive programs, and (4) enforcement.

With your permission I would like to outline briefly these separate parts.

Grants are made to municipalities for construction of sewage treatment works in the amount of 30 percent of the cost, or $600,000, whichever is the lesser amount. The grants are for new plants, for extensions to old plants, or for additions; and, they are for interceptor sewers and for outfall sewers.

To give you an idea of how this affects the immediate area, there have been 21 projects costing $15.5 million and receiving Federal grants of $3.5 million, all within a 35 mile radius of downtown Detroit. Congress has increased nationally the appropriations for this activity during the past year from $50 million to $80 million annually, and there is authorization for further increases to $100 million in the next two years.

Grants are also made to your State Water Pollution Control Agency to expand and expend its activities in the field of pollution control. Over the past six years Michigan's grant allocation has amounted to over $620,000.

Research and investigations have been carried on by the Public Health Service at its Sanitary Engineering Center, and through contracts with universities and private research organizations. Research and investigations relates to causes, to control, and to prevention of water pollution. Of particular interest is the authorization for seven new field laboratories and research centers. The University of Michigan is being considered as a potential location.

The Water Pollution Control Act further provides that studies shall be made with respect to quality of waters of the Great Lakes.

The Water Pollution Control Act calls for development of programs for eliminating or reducing the pollution of interstate waters and tributaries thereof. The Public Health Service has underway such a study in the Great Lakes and Illinois River Basin Project. In the development of this long range water quality program the Public Health Service will work closely with Federal agencies and with state water pollution control agencies, with interstate agencies, and with municipalities and with the industries that are concerned. Up to this time activity has been centered on the Illinois River Basin and on Lake Michigan because of the needs of the United States Department of Justice in the Supreme Court hearings concerning diversion of Great Lakes waters.

During this coming fiscal year it is anticipated work will be started on Lake Erie because of the intense interest in this area surrounding the lake. Basic to this program is the premise that due regard must be given to conservation measures so that ample supply of quality water will be available for municipal and industrial water supply, for the propogation of fish and aquatic life, for wildlife, for recreation, for agriculture, and other legitimate uses.

The Public Health Service also makes studies of water supply needs and benefits for Corps of Engineers multi-purpose reservoir projects. Under authorization in the Water Pollution Control Act, studies must be made of multi-purpose reservoirs regarding the inclusion of storage and for regulation of stream flow, or for the purpose of water quality control. These studies are presently being made in the Huron River Basin.

The Public Health Service operates a small laboratory in Detroit and it monitors water quality in the St. Clair River, in Lake St. Clair, and in the Detroit River. This activity provides information for the Water Pollution Advisory Board to the International Joint Commission.

Federal water pollution control enforcement authority comes into use when the Secretary of the Department of Health, Education, and Welfare has reason to believe, on the basis of surveys, that there is pollution of interstate waters, or when he is requested by a state water pollution control agency to assist in a matter of interstate pollution.

In the Water Pollution Control Act, as amended in 1961, the Secretary of Health, Education, and Welfare, is authorized to use the enforcement provisions in cases of pollution of intrastate navigable waters upon the request of the governor of the state. It is because of such a request that we are here today.

In the preparation of information for this conference, it was deemed desirable to look at the area, to get a perspective, and to see specifically the topography, the rivers, the cities, the industry, and the water uses. We took this look from a helicopter on January 17, 1962, and we recorded our trip on film. We hope to give you the opportunity for this same orientation after the close of this meeting this afternoon.

A report titled, "Pollution of Waters of the United States in Lake St. Clair, the Detroit River, and Western Lake Erie in the Detroit Area," has been prepared by the Public Health Service and was written particularly by Mr. Francis Kittrell. The report covers water uses, sources of wastes, characteristics of wastes, effects of these wastes on water quality and uses; and, finally, a summary and conclusions.

It would not have been possible to prepare this report without data and information and splendid cooperation provided by interested state and local agencies. Of particular assistance was the Michigan Water Resources Commission and the Michigan Department of Health.

We have chosen to have two persons make this presentation this morning. Mr. Rademacher will assist Mr. Kittrell. We have Mr. Rademacher to make the first part of the presentation. I would like to request that questions be withheld until the complete report has been presented.

Mr. Rademacher.

THE CHAIRMAN: That is just fine. While Mr. Rademacher is preparing himself I would like to announce that just before this meeting I got a telephone call from Representative John Dingell of this area, whom many of you know has been a long time adherent of water pollution control and a friend of water pollution control legislation. He asked that he be permitted to send in a statement for the record and he asked me to say, and I quote here, that this would be a strong statement. Without objection I think we will put this statement in the record. I have not seen that yet and it would probably be more appropriate to appear before Mr. Poston's remarks. Mr. Rademacher.

REPORT ON "POLLUTION OF WATERS OF THE
UNITED STATES IN LAKE ST. CLAIR, THE
DETROIT RIVER, AND WESTERN LAKE ERIE
IN THE DETROIT AREA," PRESENTED BY JOHN M.
RADEMACHER, SENIOR SANITARY ENGINEER,
UNITED STATES PUBLIC HEALTH SERVICE,
REGION V, CHICAGO, ILLINOIS.

MR. RADEMACHER: My name is John M. Rademacher. I am a Senior Sanitary Engineer with the United States Public Health Service in the Region V office in Chicago. The title of this report is, "The Pollution of Waters of the United States in Lake St. Clair, the Detroit River, and Western Lake Erie in the Detroit Area." This is a technical report on pollution problems in the Detroit area. Its purpose is to examine and to report on the uses made of the area's waters and on the existing sources of pollution.

Insofar as information is available, it reviews the quality characteristics of the water, as they exist today, and evaluates the effects of waste discharges on the water quality and the water uses. The report includes such conclusions as are thought to be justified on the basis of information presently available, and suggested areas in which additional investigation is needed.

BACKGROUND

Pollution of waters in the Detroit area has long been a matter of concern. Nearly 50 years ago a study of pollution of boundary waters between the United States and Canada by the International Joint Commission included the United States waters in the Detroit Area, which are the subject of this report.

That early study was undertaken to determine the causes of high incidences of typhoid fever and other gastroenteric diseases that occurred year after year. At that time all sewage was discharged to the nearest watercourse without treatment. Provisions for treatment of municipal water supplies, consisting of crude attempts at chlorination, were inadequate to cope with the contamination of the sources of water supply by pathogenic bacteria carried in the raw sewage. The reasons for the high incidences of water-borne diseases were obvious. Industrial wastes were of no consequence in those days.

In 1946-1948 the International Joint Commission again included the waters of the Detroit area in a reinvestigation of pollution of boundary waters. The 35 intervening years had witnessed marked improvements in techniques for treatment of both water and sewage. The municipalities of the Detroit area had taken advantage of the advances in water treatment to provide facilities that had conquered the water-borne epidemics. Some, but not all, of the municipalities had provided sewage treatment. The population of the area, however, had tripled, and the sewage treatment provided had not kept pace with the wastes from the expanding population. Bacterial contamination of the lower Detroit River had approximately tripled. The Area had become highly industrialized, and wastes from the factories had added new dimensions to the pollution problem. The repugnant medicinal tastes of chlorinated phenolic compounds caused recurring complaints by consumers of municipal water supplies. Oils and greases frequently fouled the surface of the waters and occasionally contributed to the death of numbers of ducks. The more subtle effects of toxic chemicals, such as waste acids, ammonia, and cyanides, were suspected in the destruction of fish.

Throughout the years the Michigan Water Resources Commission and the Michigan Department of Public Health have waged a continuing coordinated campaign against pollution of the Detroit area waters by industrial wastes and sewage. These two agencies, with their competent staffs of sanitary engineers, have made notable progress in obtaining corrective measures. Representatives of the water departments of both Detroit and Wyandotte report that phenolic contamination no longer exceeds the capabilities of their treatment facilities to prevent medicinal tastes in the water furnished to consumers. The Water Resources Commission operates a boat to check all sewer outfalls along the Detroit waterfront about three times weekly when river conditions permit. These checks are supplemented by observations at points accessible by car, and by periodic aerial surveys. Any abnormal discharge of either sewage or industrial waste is reported to the responsible authorities for immediate investigation and correction. This program has resulted in the detection and early elimination of numerous leaks or spills of both sewage and oil. All municipalities now have sewage treatment plants. The Michigan Department of Health has adopted a policy of requiring chlorination of all sewage plant effluents for bacterial control during the recreational season. This policy applies to effluents of both primary and secondary treatment plants.

In addition to the progress in providing treatment facilities that already has been achieved numerous needed improvements are in immediate prospect. Some of these improvements already are underway, contracts for others have been let, and negotiations regarding still others are proceeding among numerous political jurisdictions of the area.

Despite the very real progress that has been made, adverse effects of pollution still plague the Detroit area waters.

(1) A major municipal water treatment plant

draws water from a source with an annual average of monthly medial coliform bacterial densities which is about five times the objective of 2,400 per 100 ml recommended by International Joint Commission.

(2) A popular state park on Lake Erie has been posted as unsafe for swimming.

(3) Although the City of Detroit has prohibited swimming along its waterfront below Belle Isle, thousands of persons indulge in water sports on and in water that contains levels of coliform bacteria which reflect hazardous conditions.

(4) One major city discharges unchlorinated treated sewage and several million gallons per day of raw sewage that bypasses the overloaded plant.

(5) The sewerage systems of many municipalities intermittently discharge variable quantities of untreated sewage through storm water overflows from their combined sewers.

(6) The sewage from thousands of persons living in shore front homes in areas without sewerage systems is discharged directly to these waters without treatment or with totally inadequate treatment.

(7) The untreated sewage from many ships and boats is discharged into the waters.

(8) A major duck kill occurred as recently as

March, 1960.

(9) At least one industry has been unable, despite conscientious effort and the expenditure of considerably money, to find a technical solution to the problem of controlling suspended solids in its waste.

(10) Some industries fail to provide gaging, sampling, and analytical programs that are necessary to assure effective control of waste disposal.

(11) The rapidly expanding recreational uses of the Detroit area waters are making large segments of the public aware of the condition of these waters. Ever increasing numbers of persons engaging in aquatic recreation are being exposed to the inconveniences, the damages and the health hazards of excessive pollution.

On December 6, 1961, Governor Swainson of Michigan requested Secretary Ribicoff of the U. S. Department of Health, Education, and Welfare to provide assistance in the solution of the existing pollution problems. Governor Swainson's letter included the following: "In accordance with Section VIII of Public Law 660 as amended (P. L. 87-88), I request that you, as Secretary of Health, Education, and Welfare, assist the State of Michigan to identify and recommend methods for correcting the sources of pollution going into the Detroit River and subsequently into Lake Erie.

"Michigan's southeastern complex reflects the same type of problem that is in the many other states that have densely populated, rapidly changing metropolitan areas. The Michigan Water Resources Commission, our water pollution control agency has compiled an exemplary record of pollution abatement throughout the State. However, as is common in highly concentrated industrial areas, critical pollution problems make demands that are above and beyond the normal pollution control activities. It is to this particular problem that we address ourselves and ask for your assistance in order to correct any danger to health and welfare that may exist."

On December 18, 1961, Secretary Ribicoff replied to Governor Swainson as follows:

"This is in response to your letter of December 6, 1961, requesting action under Section VIII of the Federal Water Pollution Control Act to assist the State of Michigan in correcting sources of pollution coming into the Detroit River and subsequently into Lake Erie.

"We shall be most happy to comply with your request. Our technical staff will be in touch with State representatives to determine with particularity the scope of the problems and investigations required.

"I am sure that a cooperative State-Federal approach will be of material value in meeting these water pollution control problems of the State of Michigan."

THE AREA

The waters considered in this report (Chart 1), are on the United States' side of the International Boundary between the United States and Canada. They extend from the mouth of the south channel of the St. Clair River around the western side of Lake St. Clair, down the Detroit River and along the extreme western end of Lake Erie to the Michigan-Ohio State line.

Major tributaries included in the search for municipal and industrial wastes are the Clinton River from Pontiac to Lake St. Clair, all of the River Rouge and the Ecorse basins, the Huron River from Ann Arbor to its mouth, and the River Raisin from Adrian to Lake Erie.

Four Michigan counties have frontage on the waters involved. These are St. Clair, Macomb, Wayne and Monroe Counties. The nation's fifth largest city, Detroit and its metropolitan complex, constitutes the major portion of the land area under consideration. More than 50 percent of the population of the State of Michigan resides in this area.

(Chart 1 is as follows:)

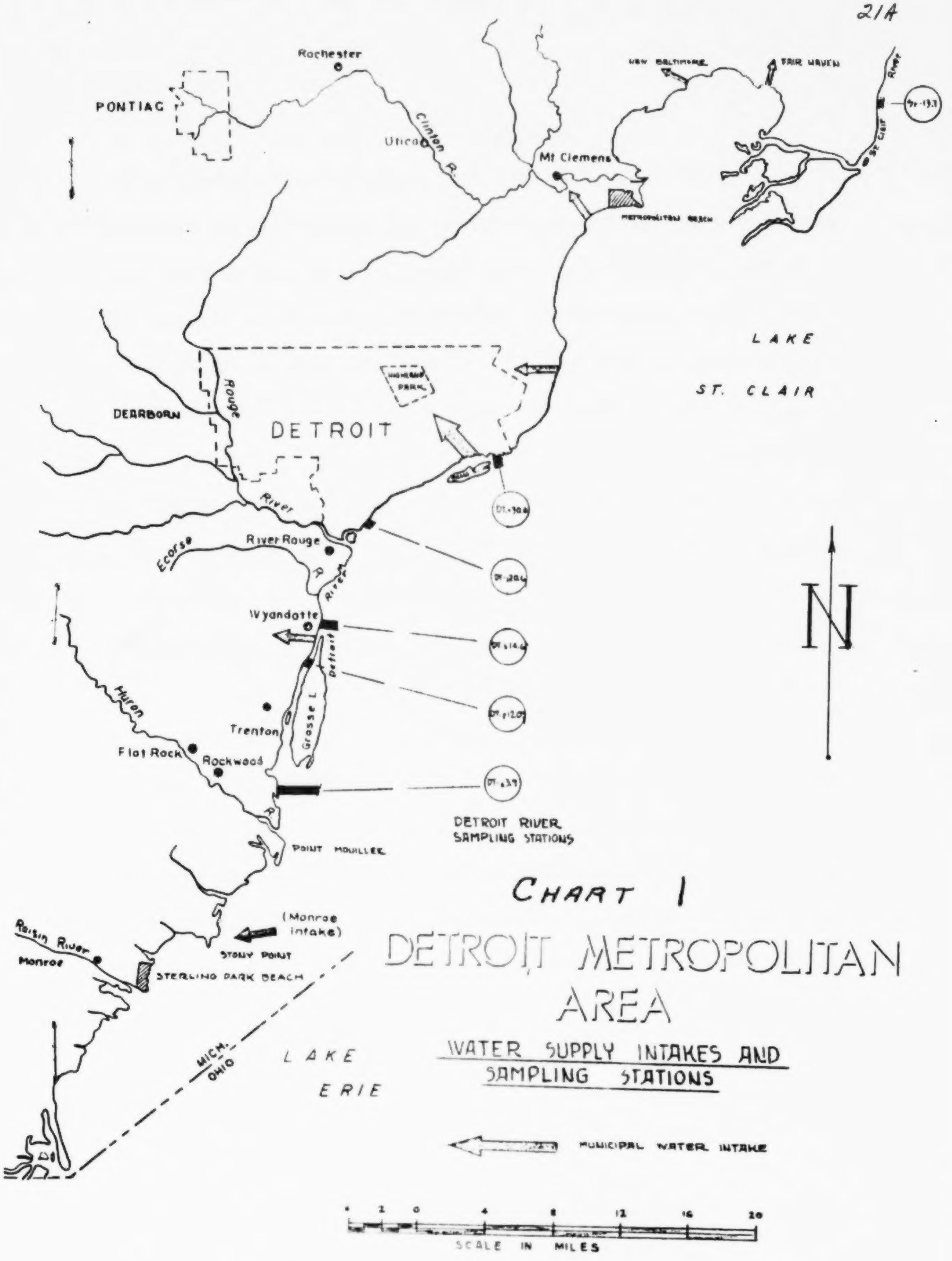
Rochester
PONTIAC
Utica
Clinton R.
Mt Clemens
NEW BALTIMORE
FAIR HAVEN
St. Clair River
Sr-13.3
METROPOLITAN BEACH
LAKE ST. CLAIR
HIGHLAND PARK
DEARBORN
Rouge
DETROIT
River
River Rouge
Ecorse R
Detroit River
DT-30.6
DT-20.6
DT-14.6
DT-12.0
DT-3.9
Wyandotte
Grosse I.
Trenton
Huron R
Flat Rock
Rockwood
DETROIT RIVER SAMPLING STATIONS
POINT MOUILLEE
(Monroe intake)
STONY POINT
Raisin River
Monroe
STERLING PARK BEACH
MICH.
OHIO
LAKE ERIE
N
MUNICIPAL WATER INTAKE
4 2 0 4 8 12 16 20
SCALE IN MILES

CHART 1

DETROIT METROPOLITAN AREA

WATER SUPPLY INTAKES AND SAMPLING STATIONS

WATER USES

The report covers uses of the waters of the area by municipalities for drinking water, industrial needs, navigation, recreation (including boating, swimming, water skiing, sport fishing, hunting, and aesthetic values attributed to water front parks and homes), fish and wildlife, and waste disposal.

MUNICIPAL WATER SUPPLIES

A recitation of the magnitude of each of these uses would reveal that with respect to municipal water supply, eight water supply systems drawing almost 503 million gallons per day distribute their treated product to 3,325,000 consumers in the area under consideration. The City of Detroit accounts for 95 percent of the pumpage and 96 percent of the consumers. Table I, which lists these supplies, and all subsequent tables in this report have been submitted to the reporter as part of the official record.

(Table 1 is as follows:)

TABLE 1

MUNICIPAL WATER SUPPLIES

MUNICIPALITY	WATER PUMPAGE mgd	POPULATION SERVED
Ira Township	0.15	2,000
New Baltimore	-	2,040
Mt. Clemens	4.56	25,550
Highland Park	9.89	38,060
Grosse Pointe Farms	3.13	12,170
Detroit	476.6	3,179,000
Wyandotte	5.65	43,520
Monroe	2.94	22,970
	502.92	3,325,310

INDUSTRIAL WATER SUPPLIES

Although exact information was not available for industrial systems, a reasonable estimate for such use is 1.5 billion gallons per day, or almost three times the municipal use.

Power plants in the area are the biggest users with a greater water volume use than the industries and municipalities combined. The total amount of water pumped through these plants is measured in the billions of gallons per day. Without water to serve its industries, the Detroit area would be merely a shadow of the thriving metropolis it is today.

NAVIGATION

Detroit became a great city because of its location. Its position on the strategic water link of the Great Lakes assures it easy and economical access to the raw materials for its basic industries.

To indicate the extent of commerce on the Detroit waterway, in a recent year there were more than 28,000 vessel passages. These vessels transported in excess of 130,000,000 tons of materials consisting primarily of iron ore, coal, grain, limestone, and petroleum products.

RECREATION

Within the past few decades the increased leisure time afforded the people of this country has placed a special emphasis on the value of recreation. It is only natural that a significant section of the Detroit Area populace turns to the water wonderland at its doorstep to while away these precious leisure hours. Swimming, boating, water skiing, fishing, and duck hunting are the primary activities available to them. In addition, the aesthetic value of the waters is attested by the thousands of shore front homes that line the watercourse at intervals from the upper end of Lake St. Clair to the Michigan-Ohio state line near Monroe.

BOATING

The status symbol in many sections of America today has become the pleasure boat. If numbers are any criteria Detroit has a great deal of status. The Secretary of State's Office here in Michigan reports that last year a total of 124,824 pleasure boats were registered in the counties of Macomb, Wayne, Oakland, and Monroe. Including three adjacent counties and adding the unregistered boats in the area, the total is estimated at 180,000 to 200,000. Only five states have more boats registered than the Detroit area.

It has been facetiously stated that on almost any summer weekend afternoon, a person could cross the Detroit River by jumping from boat to boat.

Boating is not only big pleasure in Detroit, it is also big business with a total estimated value for the boats set at $260,000,000. In addition, the amount spent for new and used boats, motors, accessories, insurance, docking, storage, maintenance, and repairs add to the economy of the area. It is estimated that almost $60,000,000 were spent for these items in 1961. Consider also that almost 200 marinas and boat clubs service these boats. The invested value of these facilities approaches $150,000,000. As an example, the Memorial Park Marina, built by the City of Detroit cost $450,000 not including land. Its 336 mooring spaces are completely filled and a long list of applicants for space is standing by. The City of Detroit recognizes this need and is planning to spend over $1,600,000 on additional marinas and boat launching ramps in the next three years.

Opposite Belle Isle on the Detroit water front three boat launching and mooring areas are in operation or under construction. St. Gene's boat launching site will have 30 launching ramps. Engle Park has 28 launching ramps, from which 24,000 boats were launched in 1960. This park will be converted to a 300-boat marina.

At Metropolitan Beach in Lake St. Clair over 6,700 boats used its pier docking facilities in 1960 and 17,500 boats were launched from its ramps.

In St. Clair Shores, on Lake St. Clair, over 3,000 boats are berthed within a one half mile stretch.

Boat service facilities are scattered along the entire water front, but significantly, most are concentrated above Belle Isle Bridge.

WATER SKIING

The increased horsepower available in today's marine outboard and inboard motors has given impetus to the sport of water skiing. The Detroit area shares the enthusiasm for this sport. Metropolitan Beach, a public facility on Lake St. Clair, even sponsors a school to teach the art of water skiing. Some 1,100 persons patronized this school alone in 1961.

SWIMMING

Only estimates can be made of the popularity of swimming in the area waters. However, a few examples might provide an indication. At Metropolitan Beach 533,500 persons used the Beach in 1961. In the same year the 3,000 feet of public beach on Belle Isle was visited by 1,165,500 people. This is the southernmost public beach in Michigan on the Detroit River or on the western shore of Lake Erie that is termed safe for swimming.

Before the Sterling State Park Beach near Monroe was posted as unsafe for swimming, attendance had reached as high as 1,239,216 in 1959.

SPORTS FISHING

Where there's water, man will wet a line in search of fish for sport and for food.

There is evidence that fishing is an important recreational activity in the Detroit area in both summer and winter. Studies on sport fishing conducted in areas similar to the Detroit area have shown that over 75 percent of the available boats were used for fishing. On the basis of the estimated number of boats in the Detroit area it appears that between 135,000 and 150,000 may be used for fishing. In the winter fishing shanties dot the ice of Lake St. Clair, where as many as 2,000 have been counted at one time.

The sport fishery of Lake St. Clair has remained fairly stable over the past 30 years. Yellow perch constitute the bulk of the catch. Other species taken include rock bass, walleye, smallmouth bass, crappie, northern pike, bluegill, and muskellunge.

Creel records of the Institute for Fisheries Research, Michigan Department of Conservation, show the species of highly desirable game fish taken in the Detroit River. In order of importance they are yellow perch, white bass, rock bass, walleye, drum, smallmouth bass, northern pike, smelt, and miscellaneous species. Trap and gill fish studies have yielded 55 percent game fish, 43 percent coarse fish, and two percent obnoxious predators. Studies made in 1952 have shown that game fish collected from the

Detroit River in the vicinity of Sugar and Stony Islands grew faster than the same species in inland waters of Michigan.

There has been a change in sport fish species taken from Lake Erie in recent years. In 1960 yellow perch comprised 97 percent of the catch, with small numbers of channel catfish and rock bass. There had been declines, from previous years, in rock bass, bullheads, white bass, walleyes, northern pike, and sheepshead.

WILDFOWL

Ducks have used the waters of the Detroit area, particularly the lower section, since before recorded time. This area is a major stop on the flyway and provides a wintering area for thousands of ducks each year. As many as 293,000 birds have been counted at one time in the area below the Ambassador Bridge to the mouth of the Detroit River during migration periods. In 1960 some 123,000 birds wintered in this same area. In the past 12 years the average for wintering birds was 40,000.

The many thousands of hunting enthusiasts in the Detroit area have this magnificent sporting resource at their doorstep although exact figures on total numbers of hunters or of ducks they bagged are not available.

Both the State of Michigan and the Federal Government have recognized the importance of this resource.

The State has set aside a 2,600 acre game preserve at Point Mouillee. The value of this land has been reported to be an estimated $31,000,000. As an indication of its popularity this state game area had 200,000 visitors in 1957.

The Federal Government is currently developing a game refuge on Grassy and Mamma Juda Islands in the lower Detroit River opposite Wyandotte.

WATER ORIENTED PARKS

Most public parks are centered around some feature of nature that has a strong public appeal. The waters of the Detroit area serve as a focal point for many public parks from Metropolitan Beach on Lake St. Clair near Mt. Clemens to Sterling State Park near Monroe on Lake Erie. Several of these parks have been mentioned earlier, in connection with boating and swimming.

One of the most popular parks is Metropolitan Beach. In 1960 this 550 acre park, with improvements that cost $9,000,000, had 1,400,000 visitors.

Belle Isle, located in the upper end of the Detroit River, is the City of Detroit's "Central Park." With its zoo, the two yacht clubs, 3,000 feet of beach, bank fishing areas, and a magnificant view of the River, this facility attracted some 30,000,000 visitors in 1960.

Wayne County operates Ecorse Park near the Ecorse River and Elizabeth Park opposite Grosse Ile.

water oriented sports are limited to the aesthestics at these parks except for three boat launching ramps at Elizabeth Park. These ramps handled over 9,000 boats in 1961.

Sterling State Park on Lake Erie near Monroe has 624 acres on which the State has spent over $1,000,000 for land improvements prior to 1960. Posting of this beach has been noted earlier.

COMMERCIAL FISHING

The elimination of competition by the commercial fishermen with the sports fisherman reflects the high value that this area places on its sports fisheries. No commercial fishing is allowed in Lake St. Clair or the Detroit River.

In the Michigan waters of Lake Erie, commercial fishing is allowed and provides employment for about 100 men. The annual catch of about 1.5 million pounds has remained fairly constant for the last 30 years. The value of the annual commercial catch is a little more than $100,000.

WASTE DISPOSAL

The waters of the area are used to receive and carry away the sewage, industrial, and other liquid wastes produced by the varied activities of the population. This necessary and legitimate use generally is practiced with the understanding that its effects must not interfere unduly with other legitimate uses. In the Detroit area waste disposal has taken priority over some other uses, as will be shown later.

The Detroit area waters receive about 663 million gallons of sewage and 625 million gallons of industrial process water daily. Wastes discharged directly to the Detroit River include 604 million gallons of sewage and at least 287 million gallons of industrial wastes per day. The River Rouge receives and delivers to the Detroit River about 300 million gallons of industrial wastes daily.

SOURCES OF WASTES

Municipal sewage and industrial wastes are the principal pollutional materials discharged continuously into the waters of the Detroit area. There are other wastes which may be small in quantity, or may be discharged intermittently. Even these may have serious local effects or may cause temporary excessive pollution. Among these wastes are combined sewer overflows, sewage from shore front homes, sewage, garbage, bilge and ballast water from ships, and materials from dredging operations.

SEWAGE

Table 2, included in this report, contains information on sources and characteristics of sewage discharged from various sources into the waters of the Detroit area.

(Table 2 is as follows:)

TABLE 2

SOURCES AND CHARACTERISTICS OF SEWAGE

WATERCOURSE	JURISDICTION	TREAT-MENT	SEWERED POPULATION		FLOW mgd	COLIFORM BACTERIA - Billions/day		BOD - lb/day		SUSPENDED SOLIDS lb/day		TYPE OF SYSTEM
			Sub-totals	Totals		Sub-totals	Totals	Sub-totals	Totals	Sub-totals	Totals	
Crappie Creek	New Baltimore	2-Cl		3,100	New plant - No data available							S
Lake St. Clair	St.Clair Co.-Shore Homes	G		4,900	0.24		283,000		686		490	-
	Macomb Co.-Shore Homes	G		2,340	0.13		132,000		328		234	-
Clinton River	Almont	2-Cl	1,250		0.12	34		52		26		SC
	Armada	2-Cl	1,100		0.17	46		33		20		C
	Clintown Twp.-No. 1	2-Cl	8,000		1.13	312		300		289		S
	Clintown Twp.-No. 2	2-Cl	9,000		0.88	243		267		207		S
	Selfridge Field - USAF	No information available - security regulations										
	Mt. Clemens	2-Cl	22,000		2.48	21		575		1,870		C
	Pontiac	2-Cl	75,000		12.9	912		1,820		2,490		SC
	Rochester	1-Cl	5,400		0.90	248		730		540		C
	Romeo	1-Cl	3,300		0.33	91		280		330		SC
	Sterling Twp.-No. 1	2-Cl	9,000		1.17	332		260		330		S
	Sterling Twp.-No. 2	2-Cl	1,400		0.08	22		3		7		S
	Utica	1-Cl	1,450		0.14	40		105		145		C
	Warren Township	2-Cl	90,000		15.9	852		3,150		5,120		SC
TOTALS - CLINTON RIVER BASIN				226,900			3,153		7,595		11,374	
River Rouge	Dearborn - West Plant	1-C	84,000		9.49	6,207,000		5,890		6,020		SC
	Dearborn - Bypassed	None	31,000		3.48	2,280,000		4,450		3,720		
TOTALS - DEARBORN				115,000			8,490,000		10,340		9,750	
Ecorse River	Wayne Metropolitan Airport	2-Cl		-	0.19		1		2		20	S
Huron River	Ann Arbor	2-Cl	90,000		8.5	697		900		549		S
	Belleville	1-Cl	1,900		0.19	52		233		190		S
	Flat Rock	1-Cl	4,600		0.33	1		467		140		SC
	Rockwood	1-Cl	2,000		0.26	55		292		125		C
	Romulus	2-Cl	2,000		0.20	56		34		80		S
	Ypsilanti	1-Cl	20,900		2.52	696		2,100		1,970		SC
	Ypsilanti - Township -No.1	2-Cl	18,000		1.85	510		540		394		S
	Ypsilanti - " 2	2-Cl	5,000		0.48	134		60		114		S
TOTALS - HURON RIVER				144,400			2,201		4,626		3,562	
Raisin River	Adrian	2-Cl	18,000		2.92	99		30		232		SC
	Blissfield	1-Cl	2,600		0.40	1		165		178		C
	Dundee	1-Cl	2,300		0.13	36		90		96		C
	Milan	2-Cl	4,100		0.52	144		60		100		C
	Monroe	1-Cl	22,900		3.58	81		2,400		1,305		SC
	Saline	2-Cl	2,300		0.16	47		55		67		SC
	Ypsilanti State Hospital	2-Cl	5,000		0.51	148		65		113		S
TOTALS - RAISIN RIVER				57,200			556				2,091	
Lake Erie	Monroe County - Shore Homes	G		3,245	0.16		184,000		465		324	-
Detroit River	Detroit	1-Cl	2,700,000		580	2,900,000		298,000		482,000		C
	Wyandotte	1-Cl	214,000		20.8	150,000		22,300		14,500		SC
	Trenton	1-Cl	19,500		3.18	68,400		3,050		2,760		SC
	Grosse Ile-Naval Air Station	1-Cl	1,000		0.10	28		120		100		C
	Grosse Ile Township - Plant	1-Cl	3,500		0.27	21		420		143		SC
	Grosse Ile Twp.-Septic Tanks	1	2,000		0.10	113,000		280		200		SC
	Wayne County - Shore Homes	G	400		0.02	23,000		56		40		-
	TOTALS - DETROIT RIVER			2,940,400			3,254,449		324,226		499,743	
TOTALS				3,497,485	662.60		12,349,360		348,268		527,618	

Treatment: 1 - Primary; 2 - Secondary; C - Chemical Precipitation; Cl - Chlorination; G - Private homes discharging direct, or with inadequate disposal.

Type of System: S - Separate; C - Combined; SC - Separate and Combined.

SEWAGE PLANTS

There are 36 sewage treatment plants in the area. Treatment provided ranges from sedimentation in a septic tank followed by chlorination, to the complete activated sludge process followed by chlorination and sand filtration. All, except the Dearborn plant, provide chlorination of the effluents for bacterial control, at least during the summer when aquatic recreation is prevalent.

The treatment plants serve an estimated total population of 3,484,000. Of this population 2,938,000, or 94.3 percent, are served by five plants discharging directly to the Detroit River. The remaining 546,000 are served by plants discharging to tributary streams. The five plants discharging to the Detroit River provide primary treatment followed by chlorination. Of the 31 plants discharging to tributary streams, 18 provide secondary treatment and chlorination. These 18 secondary plants serve 364,000 persons.

The 36 plants discharge a total of 662 million gallons per day of sewage to the area waters. Of this, 604 million gallons per day, or 91.2 percent, discharge directly to the Detroit River.

In addition to the population served by the 36 sewage treatment plants there are an estimated 2,000 persons on Grosse Ile discharging sewage to several community septic tanks, which are totally inadequate. The effluent from these tanks are not chlorinated.

LAKE FRONT HOMES

Many lake front homes are in areas without sewerage systems. The county health departments of St. Clair, Macomb, Wayne and Monroe counties report that thousands of these homes discharge sewage either directly or from inadequate septic tanks to the nearest body of water. It is estimated that the populations in this category are: 4,900 in St. Clair County; 2,340 in Macomb County; 3,245 in Monroe County; and 400 in Wayne County, for a total of nearly 10,900. The total discharge from these sources is estimated to be 550,000 gallons per day. This quantity is small in comparison with the millions of gallons per day discharged from the sewage treatment plants. The home discharges, however, contain disproportionately high concentrations of coliform bacteria and probably cause excessive local shore line contamination which may spread to adjacent beach areas.

SHIPS AND BOATS

Both commercial ships and pleasure boats discharge untreated sewage to the waters of the area. It is estimated that ships discharge sewage equivalent to that from 500 persons daily, and pleasure boats equipped with toilets discharge sewage equivalent to that from 2,700 persons daily during warm week-end days, for a total of 3,200 persons. This is a rather nebulous estimate, and is presented only as an order of magnitude rather than as a firm figure. In addition, such pollution generally is widely distributed over many square miles of water, rather than being concentrated at specific points or along particular shore lines. For these reasons, even though the ensuing bacterial contamination cannot be said to be negligible, this source of sewage is not discussed separately in subsequent considerations of the over-all effects of pollution.

COMBINED SEWER OVERFLOWS

Many of the older communities in this country have combined sewer systems. Both municipal sewage and surface runoff following rainfall are collected in the same system of sewers. The quantity of surface runoff frequently is many times that of the normal sewage flow. It is not economical to design sewage treatment plants with the capacities necessary to treat large quantities of runoff. Consequently, systems with combined sewers are designed to bypass portions of the combined sewage and surface runoff when the flows in the systems exceed the capacities of the sewage treatment plants. When overflow occurs quantities of mixed raw sewage and surface runoff discharge through bypass devices to nearby watercourses.

To avoid such raw sewage pollution of receiving waters most modern communities provide separate systems for collecting sewage and surface runoff.

There are a great many combined sewage collecting systems in the Detroit area. Table 2 includes information on the types of systems installed in the area.

Of the 36 systems listed, 12 have separate sewers, 14 have both combined and separate sewers, and 10 have only combined sewers.

Only 152,400 people, or 4.4 percent out of the total 3,484,000 population served by treatment plants are served by completely separate collection systems. The combined systems serve a population of 2,732,000, or 78.4 percent of the total. The separate and combined systems serve a population of 599,600, or 17.2 percent of the total. Thus 95.6 percent of the sewered population are served by systems which discharge some portion of the raw sewage during periods when rainfall is sufficient to cause discharge through the combined sewer overflow devices.

There are at least 124 storm water overflow points in the Detroit area. Chart 2 indicates the locations of points of combined sewer overflows in the area. These are not necessarily all the overflow points, but are those identified by governmental offices of the area during this study.

(Chart 2 is as follows:)

Of the 124 overflow points shown, 50 discharge to the Detroit River, 45 to the River Rouge, 14 to the Clinton River, 11 to Lake St. Clair, 2 to the Huron River and 2 to the Raisin River.

It is difficult to assess the pollutional effects of storm water overflows on receiving waters because there has not been sufficient study of either the characteristics of the overflows or of the effects on receiving waters during periods of overflow to develop factors that may be used in such evaluations.

Most engineering articles dealing with the problem express quantities in terms of percentage of total time that overflow occurs and percentage of total flow of raw sewage that is discharged during overflow. The percentages of total time and flow usually are quite small, and fail to indicate the temporary magnitude of pollutional discharges during periods when overflows occur.

An article by the Sanitary Engineer of the Detroit Department of Public Works states that overflow from a properly designed combined sewer system occurs about two percent of the total time, and that about one percent of the total sewage flow escapes from the system during that time. If it is assumed that these values apply to the Detroit system, the duration of overflow from the system would average about 175 hours per year. With an average

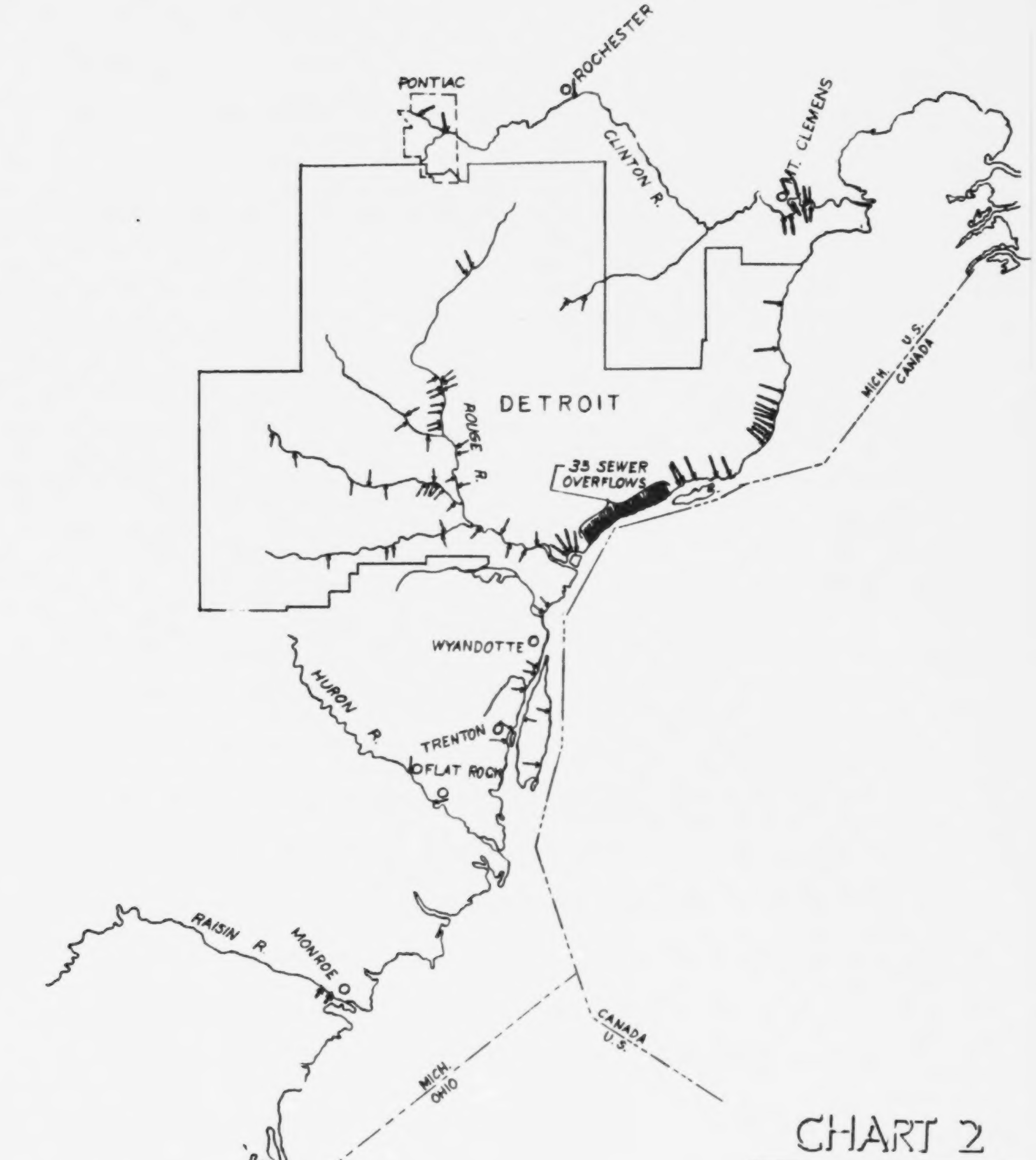
PONTIAC
ROCHESTER
MT. CLEMENS
CLINTON R.
DETROIT
ROUSE R.
33 SEWER OVERFLOWS
MICH.
U.S.
CANADA
WYANDOTTE
HURON R.
TRENTON
FLAT ROCK
RAISIN R.
MONROE
CANADA
U.S.
MICH.
OHIO
MICH.
OHIO

CHART 2

GREAT LAKES - ILLINOIS RIVER BASINS
DETROIT RIVER AREA

COMBINED SEWER OVERFLOWS

DEPT. OF HEALTH, EDUCATION & WELFARE
PUBLIC HEALTH SERVICE
REGION V CHICAGO, ILLINOIS

annual sewage flow of 580 million gallons per day in the system the total sewage escaping from the system would be 2,120 million gallons per year. During overflow raw sewage would discharge to the receiving watercourse at an average rate of 12.1 million gallons per hour. Data in the article indicate that the average duration of an individual overflow is about 2 hours. During an overflow of average duration about 24 million gallons, or about 50 per cent of the total raw sewage flow would escape to the watercourse. The durations of overflow and percentages of sewage escaping with individual storms vary widely on both sides of the average values cited, depending on intensity and distribution of rainfall.

INDUSTRIAL WASTES

Detroit is not called the "Motor City" without reason. A major portion of the industries in the area are engaged in the manufacture of cars, or of the materials, parts, and accessories that go into the manufacture of cars. Another sizeable segment of the industry of the area is devoted to the production of heavy chemicals from the extensive underground salt deposits.

Table 3 lists the industries of the area by name and location, and indicates the types of products manufactured.

(Table 3 is as follows:)

TABLE 3

SOURCES OF INDUSTRIAL WASTES

PLANT OR PLANT DIVISION	LOCATION	PRODUCT OR OPERATIONS	WASTE TREATMENT OR CONTROL
		CLINTON RIVER	
Briggs Manufacturing Company	Sterling Township Macomb County	Enameled Steel Bath Tubs	Sedimentation pickle liquor disposed of by outside contractor.
Thompson Products, Inc.	Warren		Air flotation and ponds.
Chrysler Corporation			
Defense Operations Div.	Centerline	Army Ordnance, Electroplating	Chemical treatment of electroplating wastes.
Michigan Missile Plant	Sterling Township Macomb County	Naval Industrial Reserve Plant	Chemical treatment of electroplating wastes. Effluent records available.
Parts Plant	Centerline		
Ford Motor Company			
Chasis Parts Plant	Sterling Township Macomb County		Holding Lagoon. Soluble oil treatment.
Engineering Proving Ground	Bruce Township Macomb County		
Standard Tube Company	Redford Township Wayne County		Waste Lagoon. Oil burned off. No surface discharge.
National Machine Products	Utica		Oil Separator.
		ROUGE RIVER	
Trilex Corporation	Canton Township Wayne County	Electroplating	Wastes neutralized and discharged to pond. Sludge removed from pond. Oil skimmer on pond. Chromium reduced and cyanide oxidized.
Ford Motor Company			
Lincoln - Mercury Division	Wayne County		
Evans Products Company	Plymouth		
General Motors			
Detroit Diesel Engine Div.	Detroit		Oil Separator on storm water drain.
Darling & Company	Melvindale	Dry process rendering plant.	Waste control by housekeeping. Fat separator.
Ford Motor Company			
Rouge Plant	Dearborn		
Miller Road		Iron Foundry	Sedimentation and Oil Separator.
Gate 11		Rolling Mill	Sedimentation, oil skimmed and demulsified.
Roula Creek		Blast Furnace, Engine Plant	Oil Skimmer. Soluble oil treatment. Clarifiers.
Tailrace Outlet		Steel Pickling, Coke Plant	Deep well disposal.
Peerless Cement	Detroit		Not Operating.

TABLE 3
(Continued)

SOURCES OF INDUSTRIAL WASTES

PLANT OR PLANT DIVISION	LOCATION	PRODUCT OR OPERATIONS	WASTE TREATMENT OR CONTROL
		ROUGE RIVER	
Fuel Oil Corporation	River Rouge	Distribute Fuel oil	Vessel washings to pond. Pond water passed through oil separator.
Allied Chemical Corporation			
General Chemical Division		Sulfuric Acid and Alum	Waste stream monitored by pH Recorder.
Solvay Process Division	Detroit	Soda Ash	
Plastics Division	Detroit	Tar Pitches and Oils	Waste stream, dephenolized waste and yard drainage to sedimentation and oil separation. Effluent sampled at 10-minute intervals in proportion to flow, and analyzed.
Peerless Cement	Detroit	Portland Cement	Dust electric precipitators.
Scott Paper Company	Detroit	Paper Products	White water and screened wastes discharged to small pond for sedimentation.
		HURON RIVER	
Belleville Plating Company	Belleville	Electroplating	Electroplating operations in curbed area. Chemical treatment of wastes.
General Motors Corporation			
Fisher Body Division	Willow Run	Auto Bodies	Chemical coagulation and sedimentation. Sludge vacuum filtered.
D. T. & I. Ry.	Flat Rock	Railroad Yard	Oily wastes and yard drainage treated by aeration and sedimentation.
		RAISIN RIVER	
Dundee Cement Company	Dundee	Portland Cement	Quarry wastes cascaded for aeration and removal of H_2S.
Monroe Paper Products	Monroe		Chemical coagulation and sedimentation.
Consolidated Paper Company	Monroe		
West Side		Asphalt Board	Chemical coagulation and sedimentation.
South Side		Automotive blackboard, box board	Sedimentation and sludge lagooning.
North Side		Strawboard, liner board	Sedimentation of part of waste streams.
Ford Motor Company	Monroe	Bumpers	Chemical treatment of electroplating wastes and dilution.
Union Bag-Camp Corporation	Monroe	Container board	Coagulation and sedimentation.
		DETROIT RIVER (Above Wyandotte Water Plant Intake)	
U. S. Rubber Company	Detroit	Auto Tires	Industrial wastes to City sewer.
Anaconda American Brass Company	Detroit	Copper tubes, rods, and sheets	Pickle liquor automatically neutralized. pH of effluent recorded.
Revere Copper and Brass, Inc.	Detroit		Oil separators. Pickle liquor diluted before discharge.
Allied Chemical Corp.			
Semet-Solvay Division	Detroit	Coke, ammonia liquor, tar & oils	Dephenolize ammonical liquor.
Great Lakes Steel Corp.			
Blast Furnace Division	River Rouge	Blast furnaces and coke plant	Dephenolize ammonical liquor, and use portion to quench coke. Sedimentation of blast furnace washer water.

TABLE 3
(Continued)

SOURCES OF INDUSTRIAL WASTES

PLANT OR PLANT DIVISION	LOCATION	PRODUCT OR OPERATIONS	WASTE TREATMENT OR CONTROL
DETROIT RIVER (Above Wyandotte Water Plant Intake)			
Allied Chemical Corporation Solvay Process Division	Detroit	Soda Ash	Slurries are settled in cones and sludge impounded.
Great Lakes Steel Hot Strip Rolling Mill	River Rouge	Sheets	Sedimentation and oil separation.
Dana Corporation	Ecorse	Automobile Frames	Waste pickle liquor hauled away.
Great Lakes Steel Ecorse Mill	Ecorse	Sheets, bars, rods, shapes	Oil Separators. Scale sedimentation.
E. I. du Pont de Nemours & Co.	Ecorse	Sulfuric Acid	pH of waste stream recorded.
DETROIT RIVER (Below Wyandotte Water Plant Intake)			
Archer-Daniels-Midland Company	Wyandotte	Hydrogenated Oils	Oil Separator.
Wyandotte Chemical Corporation	Wyandotte	Caustic soda, soda ash, coke, ammonia, glycol, polyesters	Coke Oven and concentrated wastes are settled in lagoons before discharge. Grab samples taken and analyzed on routine basis.
Pennsalt Chemicals Corporation Industrial Chemicals Div.	Wyandotte	Chlorine, caustic soda; ammonia hydrogen, peroxide, ferric chloride	
Firestone Tire & Rubber Company Firestone Steel Prod. Div.	Riverview	Steel rims, metal stampings	Oil separator effluent discharged to ponds in series. Dispersion Outfall.
Pennsalt Chemicals Corporation Organic Chemicals Div.	Riverview	150 organic chemicals	Some wastes are lagooned. All wastes through Oil Separator. Wastes sampled.
McLouth Steel Corporation	Trenton	Blast furnaces and rolling mill	Neutralization of pickle liquor, coagulation, sedimentation, and sludge filtration. Effluent records available. Oil Recovery.
Mobil Oil Company	Trenton	Gasoline, light oils	Phenol wastes lagooned. All wastes and drainage through oil separator, and air flotation. Sludge vacuum filtered.
Monsanto Chemical Company	Trenton	Phosphates	Wastes pass through ponds.
Shawinigan Resins	Trenton	Polyvinyl butyral	
LAKE ERIE			
Detroit Edison Company Enrico Fermi Station	Monroe	Electricity	Special Facilities Provided.

The table includes information on types of treatment or other control measures provided for the wastes. The table does not include data on sewage from plant employees. In many cases the sewage is discharged to nearby municipal sewers, and is considered to be accounted for in Table 2 on sources of sewage. In some cases the industries provide treatment plants for the plant sewage. In such cases it is assumed that at least a majority of plant employees live in surrounding sewered communities and likewise are accounted for in Table 2. It is reported that the sewage from all plants is disposed of adequately by one of the two methods.

It lists only those plants that discharge industrial wastes directly to nearby watercourses. Industries which discharge wastes to municipal sewerage systems are not included, since satisfactory disposal of these wastes is the responsibility of the municipalities involved.

The tabulation does not include information on the characteristics of the industrial wastes. Review of available records and files and visits to selected plants revealed that reliable, recent data on volumes and constituents of many of the wastes were lacking. Under existing circumstances it is not considered expedient to pinpoint certain industries for which data are available, while at the same time omitting other industries for which data are incomplete but which may be significant contributors of pollution. All of the analytical data available have been totaled for individual river basins or for selected sections of receiving waters, and are presented subsequently in this report.

56 plants are listed in the Detroit area which discharge process wastes directly to the waters of the area. The total quantity of wastes for which estimates on flow are available is 625 million gallons per day.

Nine plants are situated in the Clinton River Basin in or below Pontiac. The 3 million gallons per day of wastes contain relatively small quantities of oxygen demanding materials, suspended solids, oil, iron and cyanide. All have some form of waste treatment or control.

There are 17 plants located on the River Rouge or its tributaries. The plants produce a total of 300 million gallons per day of wastes. Principal waste constituents are oxygen demanding materials, suspended solids, oils, waste pickle liquor, phenols and ammonia. Most of the plants have some type of waste treatment or control, but there are oil spills from time to time, and some waste pickle liquor is discharged without treatment. The total quantities of oxygen demand, suspended solids, phenols, and ammonia of the combined wastes are large.

Three industries discharge directly to the Huron

River or its tributaries below Ypsilanti. Total wastes are 0.5 million gallons per day. All three plants are said to have adequate treatment.

The Raisin River receives wastes from seven plants in the vicinity of Monroe. Total waste discharge is 34 million gallons per day. Five of the plants are pulp and paper mills. One plant electroplates metals and the other produces cement. Waste constituents include large quantities of oxygen demanding material and suspended solids. Smaller quantities of toxic metallic ions and hydrogen sulfide are discharged. Wastes from one of the pulp and paper mills is reported to contain large numbers of coliform bacteria. Most of the pulp and paper wastes are settled for suspended solids reduction and the other two plants provide appropriate treatment.

Ten industrial plants discharge directly to the Detroit River above the Wyandotte water treatment plant. Total waste discharge is about 156 million gallons per day. The plants manufacture metals, including rolled steel, copper and brass products, coke, and heavy chemicals. Principal waste constituents are oxygen demanding materials, suspended solids, oils, waste pickle liquor and other acids, chlorides, phenols, and ammonia. Most of the waste pickle liquor receives only such neutralization as is provided by the natural alkalinity of the river water. Two plants dephenolize river water. Two plants dephenolize coke plant wastes, three have oil separators, one provides automatic acid neutralization, and some reduce suspended solids by sedimentation.

Nine plants discharge directly to the Detroit River below the Wyandotte water treatment plant intake. Total waste discharge is about 131 million gallons. The plants manufacture or produce steel, fabricated metals, heavy chemicals, organic chemicals, refined petroleum oil products, hydrogenated oils, phosphates, plastics and cement. Waste constituents include oxygen demanding materials, suspended solids, waste pickle liquor, oils, dissolved iron, chlorides and phenol. Common waste treatment methods are oil separation, and ponding for sedimentation and controlled waste discharge.

The single industrial plant which will discharge directly to the western end of Lake Erie is the new nuclear power plant near Monroe. This plant is not yet in operation.

OTHER WASTES

Wastes that have not been discussed thus far are difficult, without detailed investigation, to estimate quantitatively or to evaluate in terms of effects on water quality and uses. The effects of such wastes generally are relatively minor in relation to the large quantities of sewage and industrial wastes that are discharged continuously.

COMMERCIAL VESSELS

Sewage from ships and boats has been discussed previously. Review of vessel passages and routes on the Detroit, and availability of port garbage disposal facilities, indicates that there were nearly five overseas vessels per day in the summer of 1961 which might have dumped garbage in the Detroit River. If all of these vessels had dumped the garbage which accumulated between ports, the total is estimated to be 3,400 pounds per day. The actual total dumped is believed to be considerably less than this.

The foregoing does not include lake vessel passages, for which less information is available. There were about six times as many lake vessel passages as there were oversea vessel passages.

In the 1951 International Joint Commission report it was estimated that total garbage dumped in the lower Lake Huron to upper Lake Erie waters at the peak of the navigation season might be about 2,000 pounds per day.

In addition to garbage which may be dumped from commercial vessels litter is thrown overboard by thoughtless pleasure boaters.

Commercial vessels also may dump bilge and ballast waters in areas where such waters can cause adverse local conditions. Bilge water usually contains oil and greases. Ballast water may be either reasonably clean or highly polluted, depending on the area from which it is taken on board. The 1951 International Joint Commission report estimated that possibly 40 gallons of oil per day might be discharged with bilge water. No reasonable estimate of either quantity or quality of ballast water was considered feasible.

DREDGING OPERATIONS

The lower three miles of the River Rouge is dredged annually by the Corps of Engineers, usually in late fall, to maintain the navigation channel. The settled material which must be dredged consists of a mixture of sewage and industrial waste solids with alluvial deposits. In 1948 the Public Health Service made a special study of the effects of the dredging on water quality below both the mouth of the River Rouge, and the dumping area, which at that time was upstream from the western edge of Fighting Island. The dredged material dumped each day, for 46 days, averaged: 62,300 pounds of B.O.D.; 650,000 pounds of volatile solids; 32,600 pounds of iron oxide: 2,710 pounds of sulfides; and 17,400 gallons of oil. The material contained large quantities of coliform bacteria. These data reflect the heavy load of pollution carried by the River Rouge. Examination of the Detroit River showed marked increase in coliform bacteria for several miles downstream along the shore below the mouth of River Rouge, and below the dumping site. There were moderate increases in chlorides and turbidity in the same areas. At present the dredged material is hydraulically pumped into a diked area surrounding Grassy Island. No data on the effects of this method of disposal on downstream water quality have been obtained, but no complaints are known to have resulted from the present practice.

The 1948 special report of the Public Health Service noted that the Corps of Engineers, in the discharge of its delegated duties for maintenance of navigable channels, was not primarily responsible for the pollution that resulted from its dredging operations. The report concluded that the primary responsibility was with the municipalities and industries that discharged inadequately treated sewage and industrial wastes into the River Rouge.

The Corps of Engineers also conducts dredging operations in the lower Detroit River and in Lake Erie. The dredged material is transported to dumping areas offshore from Point Mouillee.

Mr. Poston, this completes the sections on water uses and sources of pollution.

THE CHAIRMAN: Thank you.

(Applause)

THE CHAIRMAN: I think before we continue it might be wise just to break and stand at your seats for about five minutes, and Mr. Kittrell will come back.

(Whereupon a recess was had.)

THE CHAIRMAN: May we reconvene. Mr. Poston.

MR. POSTON: You know, this is the first time that at one of these conferences where we have had spontaneous applause after the presentation. I don't know whether you folks are for pollution or what?

THE CHAIRMAN: Mr. Poston, we have had applause before. I don't know whether this is the first time it is spontaneous.

MR. POSTON: We will proceed with the presentation and Mr. Kittrell will be next.

STATEMENT OF F. W. KITTRELL, IN CHARGE OF POLLUTION, UNITED STATES PUBLIC HEALTH SERVICE, ROBERT A. TAFT ENGINEERING CENTER, CINCINNATI.

MR. KITTRELL: My name is F. W. Kittrell. I am in charge of Pollution Evaluation for the United States Public Health Service, Robert A. Taft Engineering Center at Cincinnati.

CHARACTERISTICS OF WASTES

In the preceding presentation wastes were discussed in terms of sources, volumes and methods of treatment. In this section sewage, industrial wastes and storm water overflows are described in terms of quantities of pollutional constituents insofar as available records or reasonable assumptions and estimates permit.

SEWAGE

The pollutional characteristics of sewage from treatment plants and shore homes are included in Table 2. The constituents chosen to describe the characteristics of the sewage are coliform bacteria, suspended solids, and 5-day biochemical oxygen demand (B.O.D.). The treatment plant operating records in the files of the Michigan Department of Health provided most of the data. In a few cases it was necessary to estimate flows, the most probable numbers (MPN) of coliform bacteria, B.O.D., or suspended solids of sewage discharges. Since the characteristics of domestic sewage and its response to treatment are everywhere so similar the estimates could be made with reasonable assurance. Estimates generally were necessary for only the smaller discharges.

Generally the data are for the period of May through October, 1961. This period was chosen because the data were the most recent available in the Department of Health files and because it covered the period when recreational use of the waters is greatest.

(Chart 3 is as follows:)

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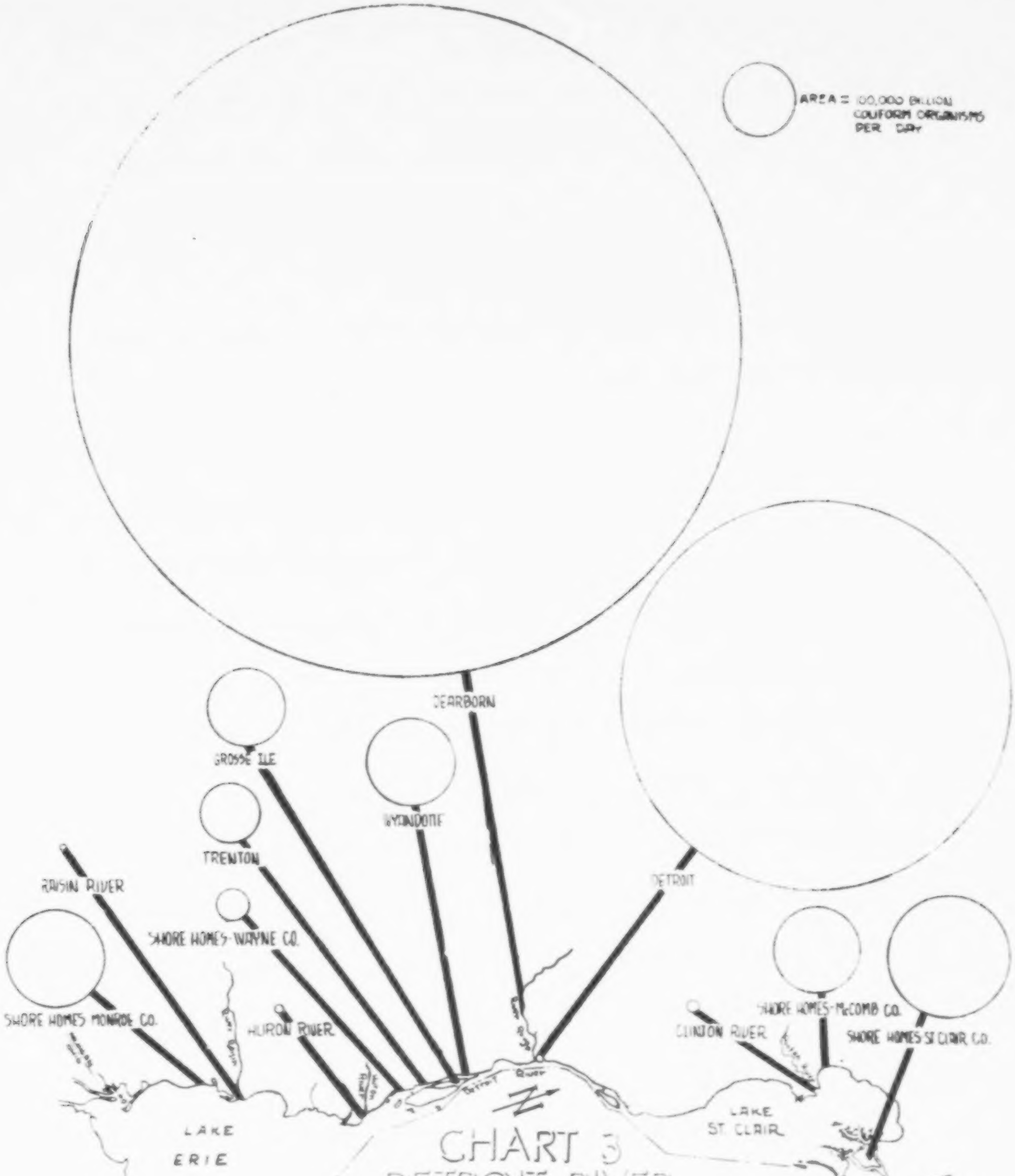

CHART 3
DETROIT RIVER

MAJOR SOURCES OF COLIFORM BACTERIA IN BILLIONS OF ORGANISMS PER DAY

Chart 3 depicts the relative quantities of coliform bacteria from the more important sources. The areas of the circles are in proportion to the quantities from the various sources.

COLIFORM BACTERIA

The mean numbers of coliform bacteria discharged daily have been calculated, in billions, from the data on MPN's and flow. The total number of coliform bacteria in all continuous sewage discharges was computed to be 12,350,000 billion per day. This number represents only a little more than three percent of the estimated coliform bacteria in the untreated sewage from all sources. This indicates an over-all reduction by treatment of about 97 percent in raw sewage bacteria.

The Dearborn treatment plant effluent plus the bypassed raw sewage was by far the largest contributor of coliform bacteria to the waters of the area. This plant accounted for 8,490,000 billion per day, or 68.8 percent of the total. When this plant is connected to the Detroit system the coliform bacteria discharged daily from all sources should be reduced to an estimated one percent of the total in all raw sewage, for an over-all reduction of about 99 percent.

The second largest contributor was the Detroit sewage treatment plant effluent, with an estimated 2,900,000 coliform bacteria per day, or 23.5 percent of the total. The Dearborn and Detroit plants together contributed an estimated 92.3 percent of the total for the entire area.

The reliability of the data cited for the Detroit plant is subject to question. During 1961 personnel of the Detroit plant noted a lack of correlation between coliform data on the chlorinated effluent and on river samples collected below the point of effluent discharge. Investigation revealed that coliform densities of samples of chlorinated effluent collected from the regular laboratory sampling tap were several times greater than the densities of samples collected from a newly installed pitcher pump. In addition, the laboratory tap samples frequently contained no chlorine residual, whereas the pitcher pump samples generally had some residual chlorine. The laboratory tap samples were pumped through a long line from the effluent outfall to the laboratory tap. The sewage was in transit through the sample line for about 10 to 15 minutes, during which time it was in contact with such biological slimes as might develop on the interior walls of the line. The pitcher pump samples, drawn from the same location on the effluent outfall, were in contact with the walls of the pump suction line for a much shorter time.

Coliform determinations were made on about 60 duplicate samples from the laboratory tap and the pitcher pump during a two-month period. A statistical correlation was developed between the two sets of data.

Following this investigation the chlorinated effluent coliform data originally reported to the Department of Health were judged to be in error for November 1, 1960, through August 22, 1961, and for the first 18 days in October, 1961. The coliform data for those two periods were adjusted on the basis of the correlation between the laboratory tap and the pitcher pump data.

In a letter dated August 21, 1961, Detroit officials notified the Michigan Department of Health of the presumed error in the chlorinated effluent coliform data. A letter dated January 5, 1962, submitted the adjusted data to the health department with a statement that the new data were believed to reflect the true quality of the plant effluent.

The adjusted data are the basis of the estimated 2,900,000 billion coliform bacteria per day discharged to the Detroit River in the Detroit treatment plant effluent. If the data originally reported to the health department were used, the computed discharge would be almost exactly ten times this number, or 29,400,000 billion per day. The latter value woudd be nearly 3.5 times the estimated Dearborn discharge.

The overloaded Wyandotte sewage treatment plant was the third largest single contributor, with 150,000 billion coliform bacteria per day, or 1.2 percent of the total from all sources. Trenton was the fourth largest individual source, with 68,000 billion, or about 0.55 percent.

The numbers of coliform bacteria discharged to tributary streams other than the River Rouge were quite small in comparison with the numbers for Dearborn, Detroit, Wyandotte, and Trenton. The total estimated for the Clinton River was 3,150 billion coliform bacteria per day, for the Huron River 2,200 billion per day, and for the Raisin River 560 billion per day. The combined total for the three river basins was 0.04 percent of the total for the entire area. The sewage treatment plants discharging to these three tributary streams served a combined population of 428,500, or 12.2 percent of the total sewered population in the Detroit area. The fact that about one-eighth of the population contributed about one-twenty-fifth of one percent of coliform contamination reflects the generally higher degrees of treatment, and the more effective chlorination practices of plants located on these tributaries.

A comparison of densities of coliform bacteria in treatment plant effluents also is revealing. Records of effluent coliform densities for ten plants on the tributary streams are available. The average MPN for the effluents of the ten plants was 1,330 per 100 milliliters.

This contrasts with the adjusted average MPN of the Detroit plant effluent of 136,000 per 100 milliliters. The average of the monthly values originally reported to the Department of Health by Detroit was 1,350,000 per 100 milliliters. The average MPN of the unchlorinated Dearborn effluent was 17,100,000 per 100 milliliters.

The relatively small populations of the shore homes of the four waterfront counties contributed a surprisingly large estimated number of coliform bacteria. The combined population of nearly 11,000 contributed an estimated total of 622,000 billion coliform bacteria per day, with: 283,000 billion from St. Clair County; 132,000 billion from Macomb county; 184,000 billion from Monroe County; and 23,000 billion from Wayne County. The 2,000 population on Grosse Ile, which contributed an estimated 113,000 billion coliform bacteria through inadequate septic tanks, may be considered in the same category as the shore front homes. This addition brings the Wayne County contribution from such sources to 136,000 billion, and increases the shore homes total contribution to an estimated 735,000 billion per day. This 5.95 percent of the estimated total for the entire area was contributed by less than 0.4 percent of the sewered population. It is nearly 15 times the combined total for the effluents from the Clinton, Huron, and Monroe river basin treatment plants, serving a combined population of 428,500, and is about one-fourth of the estimated contribution of the Detroit treatment plant.

It is instructive to consider the probable magnitude of coliform bacteria contributions by storm water overflows. Using the Detroit system as an example, it was estimated previously that 24 million gallons of raw sewage overflowed directly to the river during an average two-hour storm. The average coliform MPN of the Detroit primary tank effluent, before chlorination, was 15,100,000 per 100 milliliters during May through October, 1961. A representative of the treatment plant laboratory stated that the coliform densities of the raw and settled sewage were essentially the same. On this basis, the average storm would result in the discharge of 13,700,000 billion coliform bacteria to the Detroit River in two hours. This is more than the total discharged from all sources for an entire day, and is about four and three-quarters times the estimated daily Detroit contribution.

SUSPENDED SOLIDS

Chart 4 depicts the relative contributions of sewage suspended solids to the waters of the metropolitan area. The areas of the circles are in proportion to the loads from the various plants.

(Chart 4 is as follows:)

The total from all sources was estimated to be nearly 528,000 pounds per day, or 264 tons. Of this nearly 500,000 pounds per day, or almost 96 percent, were discharged to the Detroit River.

The Detroit treatment plant effluent accounted for 482,000 pounds per day, or 91.3 percent of the total. The Wyandotte treatment plant contributed 14,500 pounds per day, or 2.75 percent. The third largest contribution was from the combined plants on the Clinton River, with 11,400 pounds per day, or nearly 2.2 percent of the total. The Dearborn treatment plant effluent and the by-passed raw sewage accounted for 9,780 pounds per day, or about 1.85 percent. All other sources combined contributed a little less that 1.9 percent of the total.

B.O.D.

No indication has been found that oxygen depletion of the waters of Lake St. Clair, the Detroit River, and the western end of Lake Erie is a problem.

The B.O.D. data in Table 2, therefore, are not presented as an indication of a direct effect on a particular parameter of water pollution, but rather as another measure of relative quantities of sewage constituents discharged from the various sources.

The total five-day B.O.D. from all sources of sewage was 348,000 pounds per day.

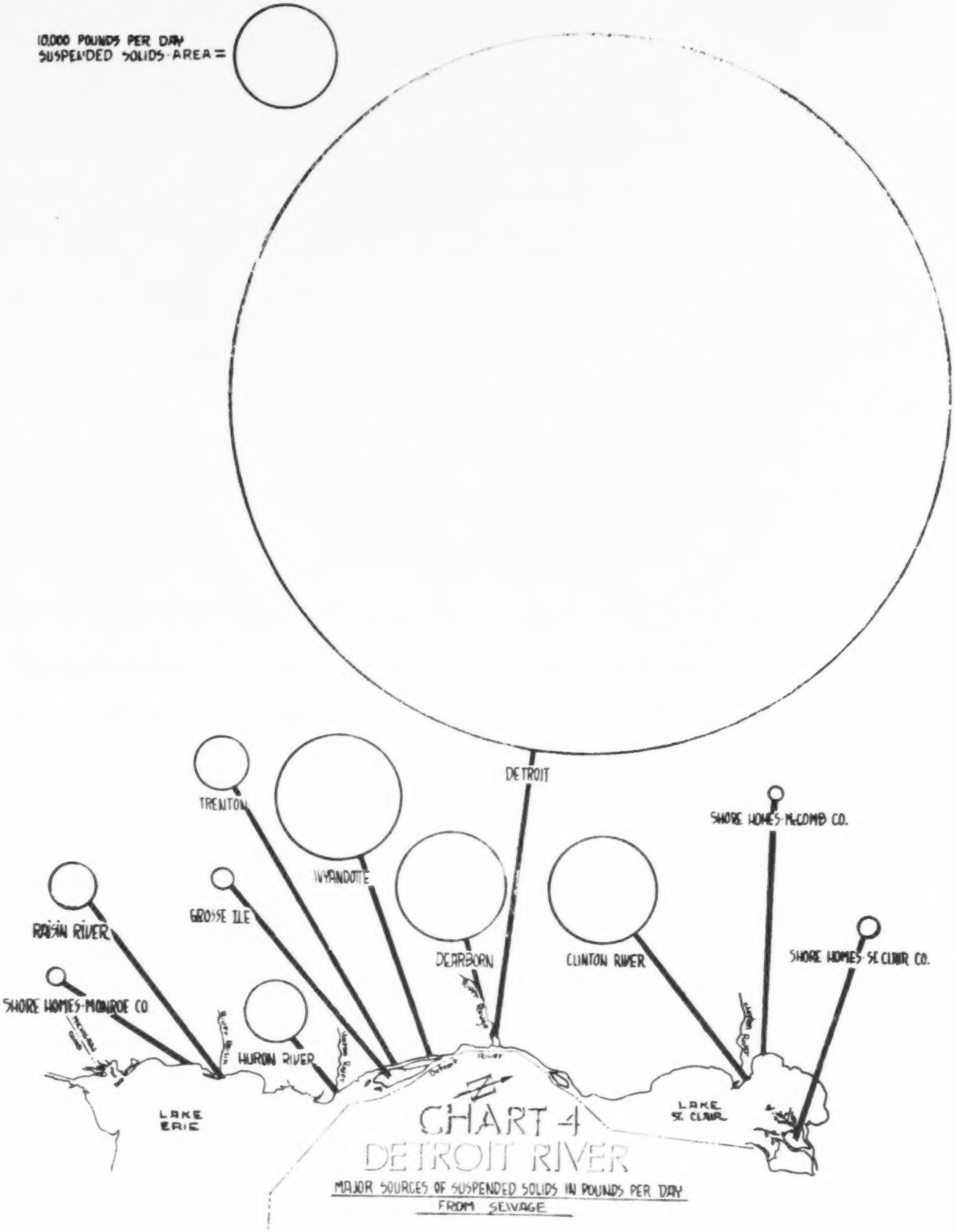
10,000 POUNDS PER DAY
SUSPENDED SOLIDS-AREA =
DETROIT
TRENTON
WYANDOTTE
SHORE HOMES-McCOMB CO.
GROSSE ILE
DEARBORN
CLINTON RIVER
RAISIN RIVER
SHORE HOMES-ST CLAIR CO.
SHORE HOMES-MONROE CO
HURON RIVER
Detroit River
LAKE ERIE
LAKE ST. CLAIR
N

CHART 4
DETROIT RIVER
MAJOR SOURCES OF SUSPENDED SOLIDS IN POUNDS PER DAY
FROM SEWAGE

Of this, 324,000 pounds per day, or 93 percent, were discharged directly to the Detroit River. The Detroit treatment plant accounted for 298,000 pounds per day, or 85.5 percent. The Wyandotte treatment plant discharged 22,300 pounds per day, or 6.4 percent.

The third largest contributor was the Dearborn plant, with 10,340 pounds per day, or nearly three percent. All treatment plants combined on the Clinton River discharged 7,600 pounds per day, or nearly 2.2 percent. All other sources combined contributed 10,000 pounds per day, or nearly 2.9 percent.

INDUSTRIAL WASTES

Industrial wastes frequently are more complex and diverse and more difficult to characterize than is sewage. Two of the parameters applied to sewage, suspended solids and B.O.D., are applicable to many industrial wastes. A few industrial wastes contain coliform bacteria. None of these three parameters apply to some industrial wastes, and the wastes may contain almost innumerable constituents that are not commonly found in sewage.

In the Detroit area the principal characteristics of most industrial wastes discharged directly to adjacent waters may be described in terms of suspended solids, B.O.D., oil, phenols, ammonia, acid, chlorides, hardness constituents, iron, and toxic ions in plating and metal finishing wastes such as cyanide, chromium, copper, and a few other metals.

Not all of these parameters apply to the wastes from any single plant. No quantitative data are available for some wastes which are known to contain certain of the constituents.

It appears expedient, as stated previously, to discuss combined totals of selected constituents for all plants in specified areas rather than to attempt to pinpoint individual plants.

Table 4 incorporates total constituents for the river basins under consideration, and for the upper and lower Detroit River.

(Table 4 is as follows:)

TABLE 4

CHARACTERISTICS OF INDUSTRIAL WASTES

STREAM	FLOW mgd.	CONSTITUENTS IN POUNDS PER DAY				
		PHENOL EQUIVALENTS	OIL	SUSPENDED SOLIDS	5-DAY BOD	AMMONIA (as N)
Clinton River	3	-	100	1,000	100	-
Rouge River	300	700	>4,000	80,000	200,000	1,000
Huron River	0.5	-	-	50	-	-
Raisin River	34	-	-	40,500	48,000	-
Detroit River						
Above Wyandotte Intake	156	250	>1,200	100,000	-	750
Below Wyandotte Intake	131	245	>2,000	280,000	4,000	8,000
TOTALS	624.5	1,195	>7,300	501,550	252,100	9,750

SUSPENDED SOLIDS

The data available indicate that about 500,000 pounds per day of suspended solids were discharged by industry to the waters of the metropolitan area. This quantity is only slightly less than the total 528,000 pounds per day from all sewage treatment plants. The sewage and industrial wastes together contributed over a million pounds per day, or more than 500 tons, of suspended solids.

Of the 500,000 pounds per day total in industrial wastes, 380,000 pounds per day, or 76 per cent, were discharged directly to the Detroit River, with 100,000 pounds per day entering above and 280,000 pounds per day below the Wyandotte water plant intake, as shown on Chart 5.

(Chart 5 is as follows:)

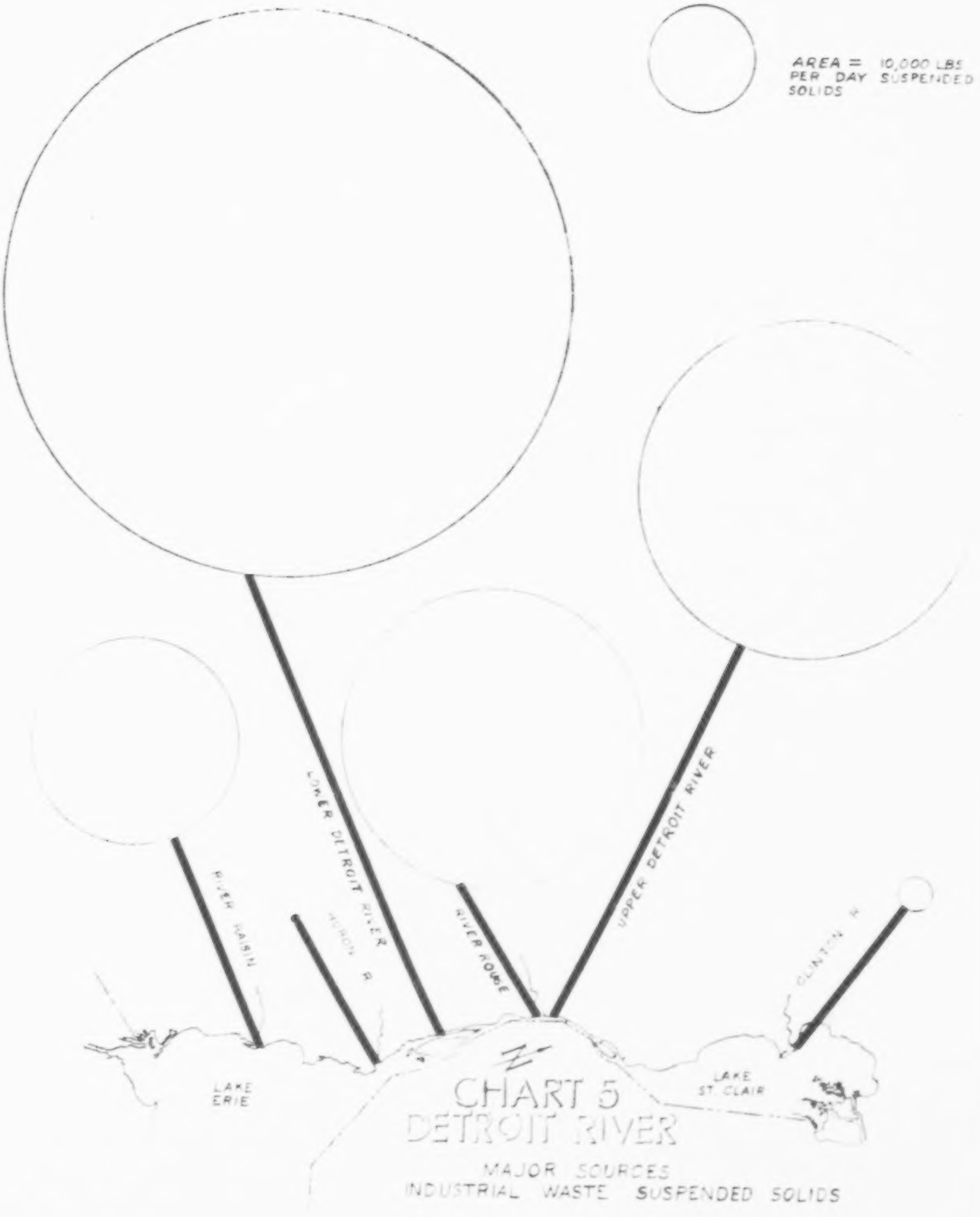

CHART 5
DETROIT RIVER

MAJOR SOURCES
INDUSTRIAL WASTE SUSPENDED SOLIDS

The 80,000 pounds per day, or 16 percent, discharged to the River Rouge was the second greatest contribution. The Raisin River received 38,000 pounds per day, or 7.6 percent of the total.

The Clinton River received 1,000 pounds per day, and the Huron 50 pounds per day.

A total of 880,000 pounds per day, or 69.5 percent, of the total from both sewage and industrial wastes, was discharged directly to the Detroit River.

B.O.D.

Table 4 includes the available data on B.O.D. of industrial wastes. The total from all sources was 247,100 pounds per day, which is about 100,000 pounds per day less than the total from all sewage treatment plants.

Most of the B.O.D. from industrial sources was discharged to the River Rouge. This stream received about 200,000 pounds per day, or 81 percent of the total in industrial wastes.

The second largest contribution was the 43,000 pounds per day, or 17.4 percent, to the Raisin River.

The Detroit River received only 4,000 pounds per day, below the Wyandotte water plant, and the Clinton River only 100 pounds per day. There was no record of BOD discharge to the Huron River.

OIL

Because of the difficulties of accurate measurement of oil, which is insoluble in water, the data on oil must be considered as approximations only, rather than as exact values.

A total of more than 7,300 pounds of oil per day was discharged to the waters of the metropolitan area. Of this more than 4,000 pounds per day, or nearly 55 percent, entered the Rouge. The Detroit River received more than 3,200 pounds per day, or nearly 44 percent. The upper Detroit River, above the Wyandotte water plant received 1,200 of the 3,200 pounds per day and the lower Detroit River, 1,200 pounds per day. One hundred pounds per day were discharged to the Clinton River.

The above values refer to oil that was discharged on a more or less continuous basis. These values do not reflect the oil leaks and spills that occur, and which may involve more oil and cause more damage than the more regular discharges. Records of the Water Resources Commission river patrol from June 30, 1960 through January 5, 1962, indicate at least 36 observations of oil on the river in the vicinity of, or discharging from, sewers, which were considered of sufficient importance to justify notification of those responsible. Fifteen of these oil discharges were from steel plants, five from municipal sewers or drains, five from automobile plants, five from coal distillization processes, two from brass production, and four from miscellaneous sources.

PHENOLS

Very small concentrations of phenols can cause taste in municipal water supplies, and can taint the flesh of fish.

Total phenols and phenolic compounds discharged from industries were nearly 1,200 pounds per day. 700 pounds per day, or 58.7 percent, entered the River Rouge. About 495 pounds per day were discharged to the Detroit River, with about one-half entering above the Wyandotte water plant intake and the other half below the intake.

No recent data were obtained for phenols in the effluents of sewage treatment plants. The International Joint Commission study in 1946-1948 included analyses for phenols at the Detroit sewage treatment plant. At that time the effluent contained 438 pounds per day. Since that time the effluent discharge has increased from 350 to 580 million gallons per day. This does not necessarily indicate a proportionate, or even any, increase in phenols. If additional phenol-producing industries have been added to the collection system the total phenols in the effluent may have increased.

AMMONIA

Total ammonia (as N) discharged by industry to the waters of the area was about 9,750 pounds per day.

Of this, 8,000 pounds per day, or 82 percent reached the Detroit River below the Wyandotte water intake. 1,000 pounds, or 10.2 percent, entered the River Rouge. The remainder, 750 pounds per day, was discharged to the Detroit River above the Wyandotte intake.

No recent data on ammonia in the Detroit sewage treatment plant effluent were obtained. In 1948 the effluent contained 52,500 pounds of ammonia per day. It is probable that the ammonia has increased at least roughly in proportion to the increase in flow to about 87,000 pounds per day, or about nine times that in the industrial wastes.

ACID

A number of plants discharge large quantities of spent acid to the Detroit River. The waste pickle liquor from several steel mills consists principally of strong sulfuric acid and ferrous iron in solution.

Data on total quantities of waste acid are lacking, but the results of a 1955 study of wastes from one steel mill indicate the magnitude of such discharges. The plant was discharging about 200,000 pounds per day of sulfuric acid which was accompanied by 40,000 pounds per day of ferrous iron.

CHLORIDES

The wastes from several plants contain large quantities of chlorides, but data on total quantities are not available.

As one example, a single large industrial operation was discharging 3,000,000 pounds per day of chlorides in 1954. A large portion of the chlorides were in the form of calcium chlorides, which increase the hardness of the waters receiving the wastes.

REDUCTIONS IN INDUSTRIAL WASTES

Substantial reductions in pollutional constituents of industrial wastes have been accomplished since the International Joint Commission study of 1946-1948. The comparison of total quantities of materials discharged directly to the United States waters of the Detroit River at that time with the estimates of present quantities is revealing:

TABLE 5

Reductions in Industrial Waste Constituents
Detroit River
1946-1948 to Present

	Oil gal/day	Phenolic Compounds lb/day	Ammonia (as N) lb/day	Suspended Solids lb/day
1946-1948	16,240	4,890	11,010	1,699,200
Present	430	495	8,750	380,000
Percent Reduction	97.5	89.9	20.5	77.5

Between 1946 and 1948 the oil has been reduced from

16,240 gallons per day to 430 gallons per day, or a reduction of 97.5 percent. Phenols and phenolic compounds have been reduced from 4,890 pounds per day to 495 pounds per day, or a reduction of 89.9 percent.

Ammonia has been reduced from 11,010 pounds per day to 8,750 pounds per day, or a reduction of 20.5 percent.

Suspended solids have been reduced from 1,699,200 pounds per day to 380,000 pounds per day for a reduction of 77.5 percent.

EFFECTS OF WASTES ON WATER QUALITY AND USES

The principal effects on water quality of Lake St. Clair, the Detroit River, and western Lake Erie which have caused concern appear to have resulted from pollution by sewage bacteria, phenols, oils, and suspended solids.

The effects of each of these waste constituents will be dealt with separately in relation to impact on water quality and uses.

The International Joint Commission, in its 1951 Report on Pollution of Boundary Waters proposed certain objectives of water quality for guidance in the control of pollution of boundary waters. The objectives will be used, where appropriate, for evaluating water quality in subsequent sections of this report.

COLIFORM BACTERIA

The International Joint Commission objective for coliform bacteria in the boundary waters is that the median MPN shall not exceed 2,400 per 100 milliliters at any point after initial dilution of sewage with the receiving waters.

Coliform objectives commonly are based on arithmetic averages rather than median values. Use of the median tends to suppress the effects on the mean of densities in the higher ranges. When the higher densities occur ingestion of the water would be most hazardous to health.

The St. Clair River is not covered by this report, but is of interest as the source of water for Lake St. Clair. Samples were collected on nine dates at four points across the United States side of the river at Range SR 13.7 (13.7 miles above the mouth of the St. Clair River) during May 1960 through April 1961. The median MPN values for the four points ranged from 230 to 430 per 100 milliliters, with an integrated average of 300 per 100 milliliters. This was well below the objective of 2,400 per 100 milliliters.

The bacterial quality of the waters of Lake St. Clair generally was quite good, although there undoubtedly were localized areas of excessive contamination along some sections of the lake shore. The 1951 International Joint Commission report, on the basis of extensive sampling, showed no median values in excess of 1,000 per 100 milliliters. The higher median values were limited to the Anchor Bay area, the immediate vicinity of the mouth of the

Clinton River, and along the western shore line.

Much less extensive data than those in the 1951 report are available for this report, but such data as are available indicate that the bacteriological quality in Lake St. Clair generally has not deteriorated significantly since the earlier work.

The Ira Township water supply intake is located about 1200 feet offshore, almost directly south of Fairhaven, in the northeast area of Anchor Bay. The annual average MPN of the raw water was 434 per 100 milliliters for December 1960 through November 1961. The maximum monthly mean was 752 per 100 milliliters in November. This represents water of good bacterial quality for a source of municipal supply.

The results of studies in 1956 and 1957 indicated that the Clinton River near its mouth was highly contaminated. The median coliform MPN of the river was 43,000 per 100 milliliters. During flood flow a portion of the flow is diverted to a cutoff channel which enters Lake St. Clair about 2.5 miles southeast of Mt. Clemens. The same studies yielded a median MPN of 150,000 per 100 milliliters near the mouth of the cutoff. This high value may reflect the effect of storm water overflows from upstream sewerage systems.

These high densities of coliform organisms undoubtedly caused excessive contamination of localized areas in Lake St. Clair around the mouths of the river and the cutoff, and constituted a health hazard to anyone coming in intimate contact with the water in these areas. The effects appear largely to be dispersed before the river water penetrates very far into the lake, although there is some evidence that bacterial contamination from the cutoff occasionally may reach the Mt. Clemens water supply. The popular Metropolitan Beach lies between the mouths of the river and the cutoff, in the vicinity of Point Huron. Median coliform densities at points along the beach front during the 1961 bathing season varied from 91 to 230 per 100 milliliters. The Mt. Clemens water supply intake is situated about one mile offshore, approximately east of the mouth of the cutoff. The annual average MPN of the raw water for December 1960 through November 1961 was 1,240 per 100 milliliters. There was a maximum monthly mean of 6,160 per 100 milliliters in April, 1961. Bacterial quality at this intake may be influenced at times by the pollution from the cutoff, and possibly from Clinton River. In December 1959, the monthly mean was 4,670 per 100 milliliters, and in January 1960, the mean was 5,580. Although of good bacterial quality most of the time the Mt. Clemens raw water occasionally is subject to moderate contamination.

The Highland Park and Grosse Pointe Farms common waterworks intake is located about 2,000 miles offshore slightly northeast of Grosse Pointe Farms. The mean bacterial quality of the raw water was not included in the operating records submitted to the Michigan Department of Health. Individual MPN values were recorded as low as zero in every month of the period, December, 1960, through November, 1961, but maximum values were as high as 24,000 per 100 milliliters. The maximum month appears to have been March, 1961, when seven values of 24,000 were reported. The higher values occurred during months when precipitation normally is high.

THE CHAIRMAN: Mr. Kittrell, there is one error we note. I think you said 2,000 miles when you meant feet.

MR. KITTRELL: That is a little exaggeration. Would you make that correction, please? It should be 2,000 feet.

THE CHAIRMAN: Mr. Kittrell, I wonder if at this time we might consider breaking for lunch. Before we do though, I would like to introduce several people.

MR. KITTRELL: May I finish this one paragraph? I haven't quite finished it.

THE CHAIRMAN: Yes.

MR. KITTRELL: This suggests that the water at this intake may have been affected by storm water overflows from combined sewers along the waterfront.

THE CHAIRMAN: I would like to introduce Mr. Milton P. Adams, Executive Director of the Michigan Water Resources Commission. Mr. Adams. Mr. Adams has been a national figure in this field and has contributed in no small measure to the Federal program and Federal legislation.

Mr. John Vogt, State Sanitary Engineer of the Michigan State Health Department. Mr. Vogt.

Marvin Fast, who is here from the Great Lakes Commission. Mr. Fast.

And Boyd Benedict, the Governor's representative, who is in the rear of the room.

With that, let us stand in recess for lunch until 1:30 sharp when we will reconvene.

(Whereupon at 12:00 o'clock noon the hearing was recessed until 1:30 p.m. of the same day.)

AFTERNOON SESSION

THE CHAIRMAN: May we reconvene? Mr. Poston.

MR. POSTON: We will continue with Mr. Kittrell's report.

FURTHER STATEMENT OF F. W. KITTRELL

MR. KITTRELL: I have just completed talking about the water quality as far as bacterial quality is concerned in Lake St. Clair before adjournment.

The excellent bacterial quality of the water leaving Lake St. Clair is reflected in the results of sampling at ten points across the American section of the river on Range Dt. 30.0, near the head of the Detroit River. Here the median densities for nine sampling dates during 1960 ranged from 48 to 240 per 100 milliliters. The mean for all points was 107 per 100 milliliters.

(Chart 6 is as follows:)

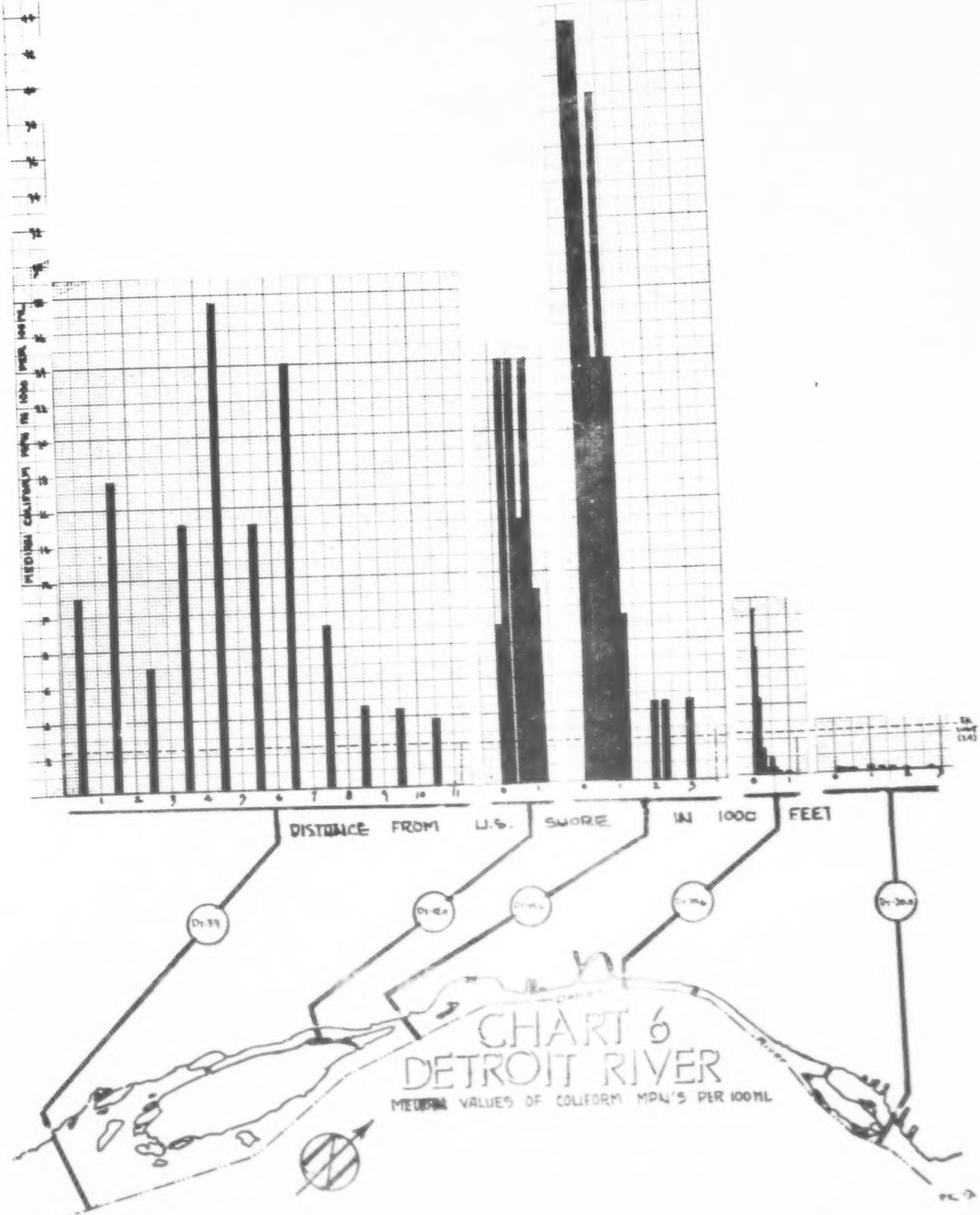

CHART 6
DETROIT RIVER
MEDIAN VALUES OF COLIFORM MPN'S PER 100ML

MR. KITTRELL: On this chart is shown a line at the level which represents the International Joint Commission objective of 2,400 per 100 milliliters at Range 30 at the head of the Detroit River. All of that is well below that line.

The low bacterial density at Range Dt 30.0 was confirmed by the excellent bacterial quality of the raw water of the Detroit supply, which is drawn from the river at the upper end of Belle Isle, about three-quarters of a mile below Range Dt. 30.0. The annual average MPN of this supply during 1961 was 55 per 100 milliliters.

About 8.5 miles downstream, and about one mile above the Detroit Sewage Treatment Plant and River Rouge, at Range Dt. 20.6, deterioration of the bacterial quality of the Detroit River became apparent. At eleven points on this range median densities from seven sampling dates varied between 930 and 9,300 per 100 milliliters. The median values at two of the eleven points equalled the objective of 2,400 per 100 milliliters, and at four points exceeded the objective. The higher values were within 500 feet of the shore. The integrated mean for all points was 1,800 per 100 milliliters. Two of 77 values on individual samples taken on this range were 43,000 per 100 milliliters, two were 73,000, four were 93,000, and three were 240,000. This illustrates how use of the median minimizes the significance of the higher and more hazardous values, which probably resulted from storm water overflows from the high concentration of overflow points immediately upstream.

At Range Dt. 14.6, about five miles below the Detroit Sewage Treatment Plant and River Rouge, 13 points across the river were sampled. The Wyandotte water plant intake is just below this range. Median MPN values at the thirteen points ranged from 4,300 to 43,000 per 100 milliliters. Five points, between 20 and 400 feet offshore yield medians of 43,000 per 100 milliliters. Three points between 2,000 and 3,000 feet offshore yielded medians of 4,300 per 100 milliliters. Values between these two extremes were found at points between 600 and 1,100 feet offshore. Thus every median was between 1.8 to 18 times the coliform objective. The integrated mean for all points was 13,200 per 100 milliliters. This was about 44 percent higher than the integrated value of 9,200 per 100 milliliters for the 1946-1948 study.

Monthly average MPN values of the Wyandotte raw water for 1961 are shown on Chart 7. The annual average of the monthly values was 21,700 per 100 milliliters. In two months, June and September, the average MPN's were 50,000 per 100 milliliters. Chart 7 includes the monthly average values for the Detroit raw water, which averaged 55 during 1961. Here the maximum average MPN for any month was 260 per 100 milliliters in March.

(Charts 7 and 8 are as follows:)

MR. KITTRELL: Chart 8 presents a comparison of median coliform values of the Wyandotte raw water from August 1950, when the present intake was placed in operation, through December 1952, and from August 1959 through December 1961. The median MPN for the earlier period was 6,400 per 100 milliliters, and nearly double that, or 12,200 per 100 milliliters for the later period.

Charts 7 and 8 illustrate the differences that result from the use of median and average values. The use of the two systems in this report stems from the different statistical methods used by the various agencies from which data were obtained. It was not feasible, in the time allotted for preparation of this report, to process the masses of daily data available to obtain means by a single method. Where comparisons are made with the International Joint Commission median objective the mean values used are medians.

The raw water source for the Wyandotte municipal supply is grossly contaminated by sewage bacteria. The major sources of the bacteria are the Detroit Sewage Treatment Plant effluent, and the highly contaminated River Rouge, which enter the river about five miles upstream from the Wyandotte intake, and storm water overflows. The bacteria from the treatment plant and the River Rouge, and other pollution accompanying them, reach the water intake

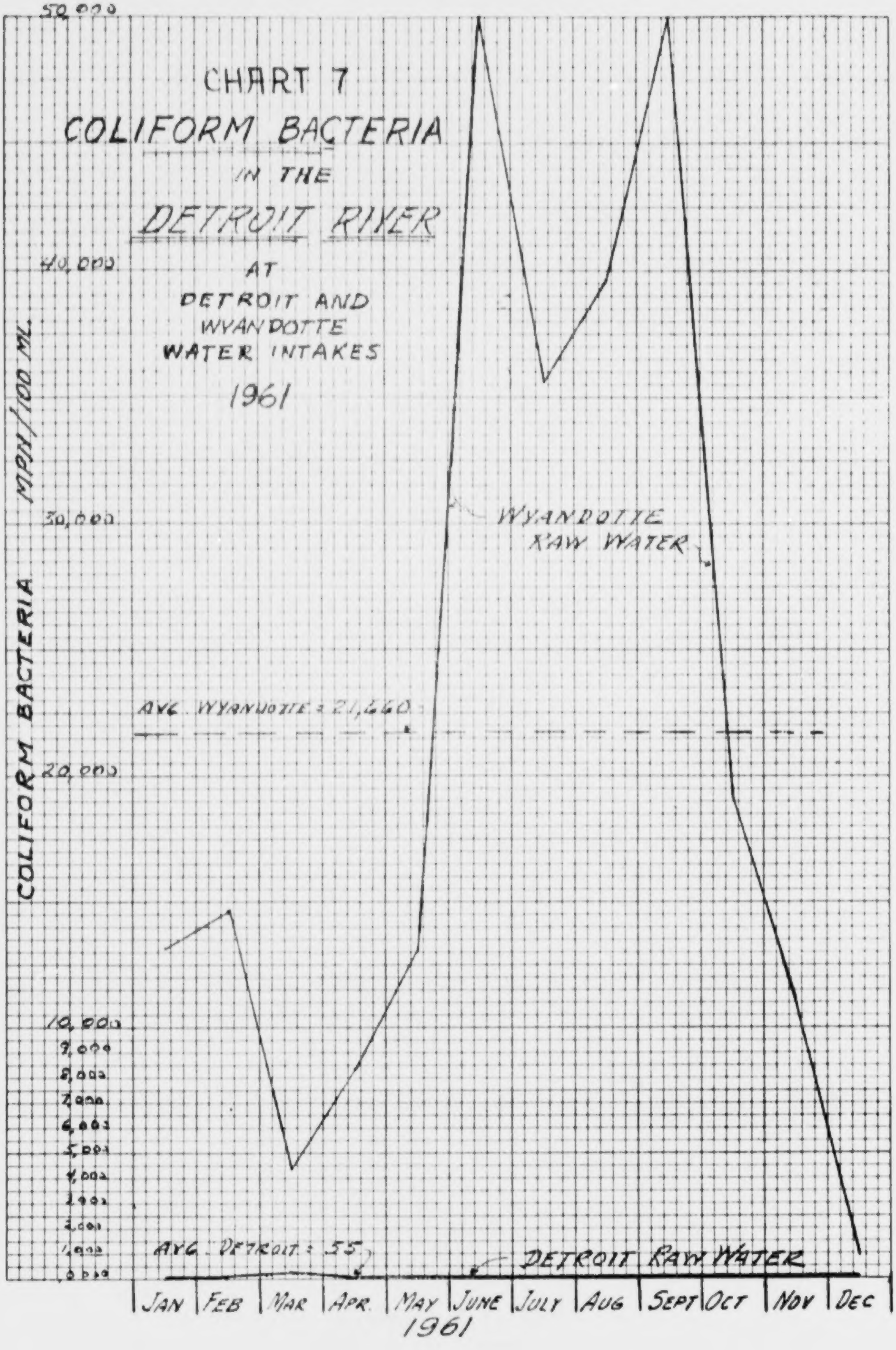

CHART 7
COLIFORM BACTERIA
IN THE
DETROIT RIVER
AT
DETROIT AND
WYANDOTTE
WATER INTAKES
1961

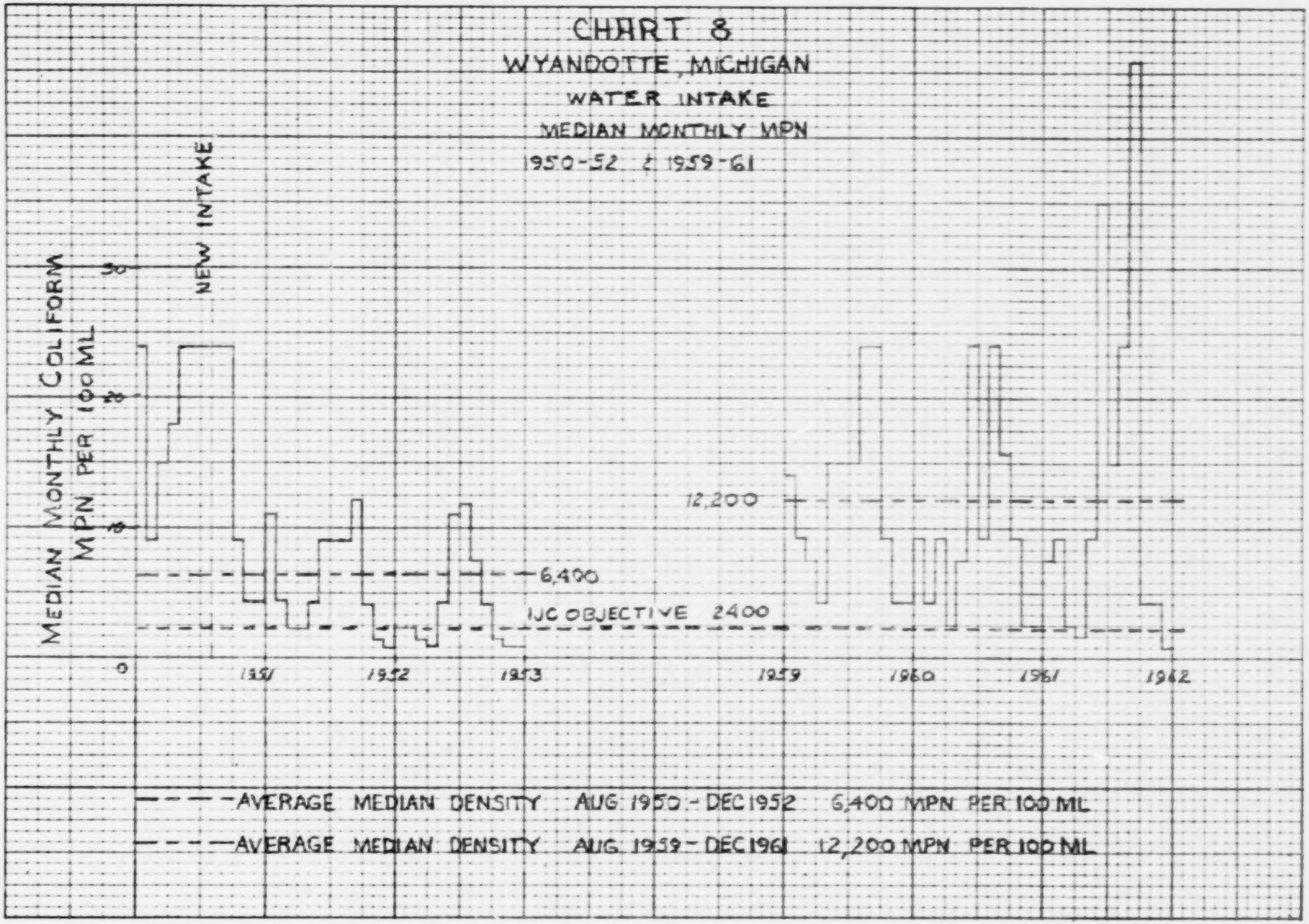

CHART 8
WYANDOTTE, MICHIGAN
WATER INTAKE
MEDIAN MONTHLY MPN
1950-52 & 1959-61

in about four hours after they enter the river. Under the circumstances constant vigilance and special precautions in operation of the Wyandotte treatment processes are essential to assure production of a bacteriologically safe and potable water at all times. The residual of chlorine that is applied to the raw water is monitored constantly by automatic equipment which sounds an alarm if the chlorine residual drops below the necessary concentration. When this occurs the chlorine dosage is increased manually to meet the increased chlorine demand. There is the ever present possibility of a mechanical or electrical failure, or of a human error in adjusting treatment processes to meet the fluctuating quality of the raw water. Such failure or error could permit water contaminated with sewage bacteria to pass through the treatment plant and enter the distribution system. Should this occur an epidemic of water-borne disease among consumers of the water probably would follow.

Trenton formerly maintained its own water supply system, which drew water from the Trenton Channel several miles below Wyandotte. The treatment plant serving this system was abandoned in the early 1940's when expansion of the plant to provide additional capacity became necessary. The excessive pollution of the raw water source played a part in this decision. Water is now obtained from the

Wayne County Metropolitan Water Supply.

On Range 12.0 in the Trenton Channel, 2.4 miles below the Wyandotte water intake, six points were sampled, as shown on Chart 6. This range is below the Wyandotte sewage treatment plant. The median values varied between 9,300 and 24,000 per 100 milliliters, including medians of 24,000 at three of the six points. The medians were 3.9 to 10 times the objective. The integrated mean for the range was 20,500 per 100 milliliters. This was 25 percent higher than the integrated mean of 16,400 per 100 milliliters from the 1946-1948 study.

Recent sampling at the farthest downstream range, Dt. 3.9, has been limited, with samples collected on only six sampling dates from each of the eleven points on this range during March to July, 1961. The data for this range, therefore, are less meaningful than those for ranges 14.6 and 12.0, which were sampled 44 and 39 times respectively. The medians of these data range from 4,400 to 19,500 per 100 milliliters. The integrated mean for the range was 12,700, compared to 21,800 per 100 milliliters from the 1946-1948 study. This indicates a reduction in bacterial contamination of more than 40 percent during the intervening years, but no such reduction is supported by the more abundant data for ranges 14.6 and 12.0, where increased contamination was indicated.

The Monroe water plant intake is situated about one mile southeast of Point Aux Peaux in the western end of Lake Erie. The annual average MPN of the raw water was 792 per 100 milliliters from December 1960 through November 1961. The maximum monthly average was 2,120 in October 1961. During December 1960 through November 1961, seven daily MPN values were as high as 11,000 to 14,000 per 100 milliliters, but no other daily value exceeded 4,600 per 100 milliliters. During the past two years the highest monthly average was 3,730 per 100 milliliters in July 1960. The bacterial quality of the raw water at the Monroe intake generally is satisfactory as a source of municipal supply.

Sterling State Park Beach fronts on Brest Bay, about five miles southwest of the Monroe water intake. The beach lies between one and two miles north of the mouth of the Raisin River, which flows through Monroe. Starting near the northern end of the beach and extending around Brest Bay for about four miles to Stony Point, homes line the waterfront. These homes are in areas which do not have municipal sewerage systems. Disposal of sewage in these areas is either directly to the nearest water, including Brest Bay, or to individual underground disposal systems. High ground water levels and tight soils cause many of the underground disposal systems to fail. Such failure permits the sewage to flow to the nearest watercourse. Sandy Creek enters Brest Bay near the northern end of Sterling State Park Beach. Stony Creek enters the bay about halfway between Sandy Creek and Stony Point. Both of these creeks pass through unsewered communities.

In 1956 the Michigan Water Resources Commission collected samples for coliform bacteria determinations from six points short distances offshore along Sterling State Park Beach. The MPN results of 15 to 20 samples at each point varied widely. At the northern end of the beach the densities of coliform bacteria varied between 9.1 and 24,000 per 100 milliliters, with three values above 2,400 per 100 milliliters. At the southern end of the beach the densities ranged from 93 to 140,000 or more per 100 milliliters, with four values above 2,400 per 100 milliliters. The bacterial densities varied similarly at the four intermediate sampling points, with the lowest contamination occurring near the middle of the beach. Of 100 samples collected 23, or nearly one quarter, yielded MPN values in excess of 2,400 per 100 milliliters. In 1957 sampling was extended to include possible sources of bacterial contamination in the surrounding area. The largest single source of coliform bacteria was one of the five pulp and paper mills in Monroe. The effluent from this plant had a median density of 43,000,000 coliform bacteria per 100 milliliters, for a total daily discharge of 13,000,000 billion coliform bacteria per day. It was established that at least some of the coliform bacteria were of fecal origin. Another large contributor, based on the estimate in Table 2, was the Monroe County shore front homes, with a total estimated contribution of 184,000 billion per day. The Monroe sewage treatment plant, with chlorination of the effluent, accounted for 3,100 billion. The Raisin River at its mouth reflected the high coliform load primarily from the pulp and paper mill, with a median density of 330,000 per 100 milliliters. Sandy Creek had a median density of 4,300 per 100 milliliters and Stony Creek had 9,300 per 100 milliliters.

Subsequently, acting upon the advice of the Michigan Department of Health, the Michigan Department of Conservation posted Sterling State Park Beach as unsafe for swimming. Attendance at the park had been as high as 1,239,000 in a season. After the beach was closed attendance at the park dwindled. State funds in excess of $1,000,000 previously had been spent on the park. Additional expenditures for further development of the park have been postponed. The publicity attendant on this situation has caused concern among owners of nearby shore front homes, who now question the quality of water along their private beaches.

Bacteriological data throughout all of the watercourses indicate that contamination generally is greatest close to the shore. In areas where bacterial densities are high those launching boats from shore must pass through the zone of greatest contamination before reaching the less contaminated water farther from shore. Children and others playing, wading, or swimming near the water's edge likewise are exposed to high concentrations of contamination.

Chart 9 illustrates the bacterial quality along the Detroit water front, from the head of the Detroit River to about one mile below the mouth of the River Rouge. These data were obtained by the City of Detroit Health Department. Above Belle Isle the coliform densities were relatively low, with MPN medians of less than 1,000 per 100 milliliters. Near the upper end of Belle Isle the density increased to about 4,400 per 100 milliliters, which is above the objective of 2,400 per 100 milliliters. From this point downstream the contamination increased markedly, with all medians at the seven remaining points greater than 40,000 per 100 milliliters throughout the rest of the reach. The maximum value at any sampling point was 158,000 per 100 milliliters at the foot of Joseph Campau Avenue. Anyone ingesting a single drop of water with this bacterial density would swallow about 80 sewage bacteria. At an MPN of 40,000 per 100 milliliters each drop of water would contain about 20 coliform bacteria. Under the circumstances the City Health Department has been wise in prohibiting swimming along the Detroit waterfront.

The International Joint Commission Field Unit made a special study of the effects of storm water overflow on bacterial quality at Range 20.6, about one mile above the Detroit Sewage Treatment Plant and below the numerous sewer overflows along the Detroit waterfront. This range was sampled at ten points both during dry weather and following three storms when sewage overflows to the river occurred. The median coliform results are shown on Chart 10.

(Charts 9 and 10 are as follows:)

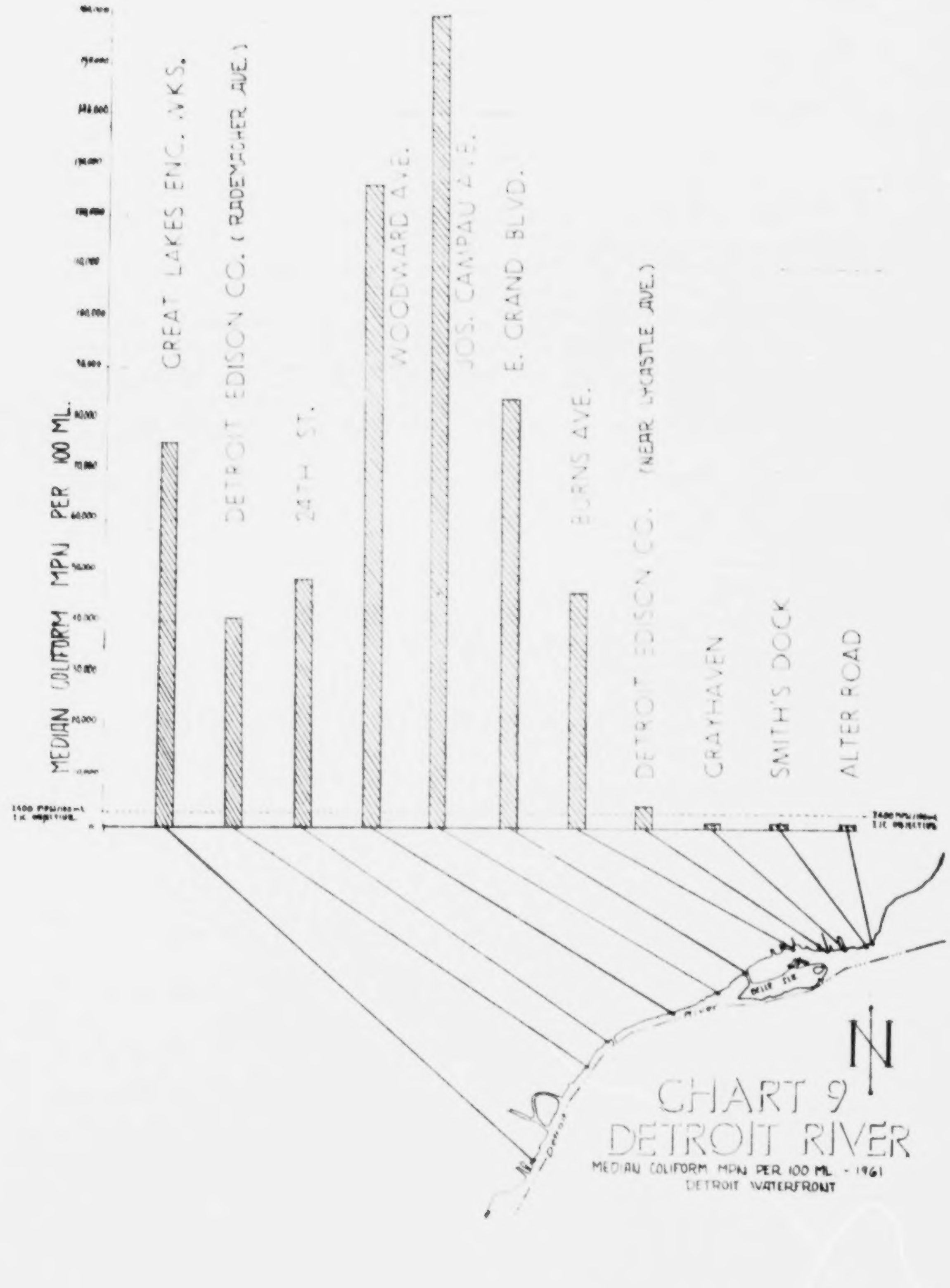

CHART 9
DETROIT RIVER
MEDIAN COLIFORM MPN PER 100 ML - 1961
DETROIT WATERFRONT

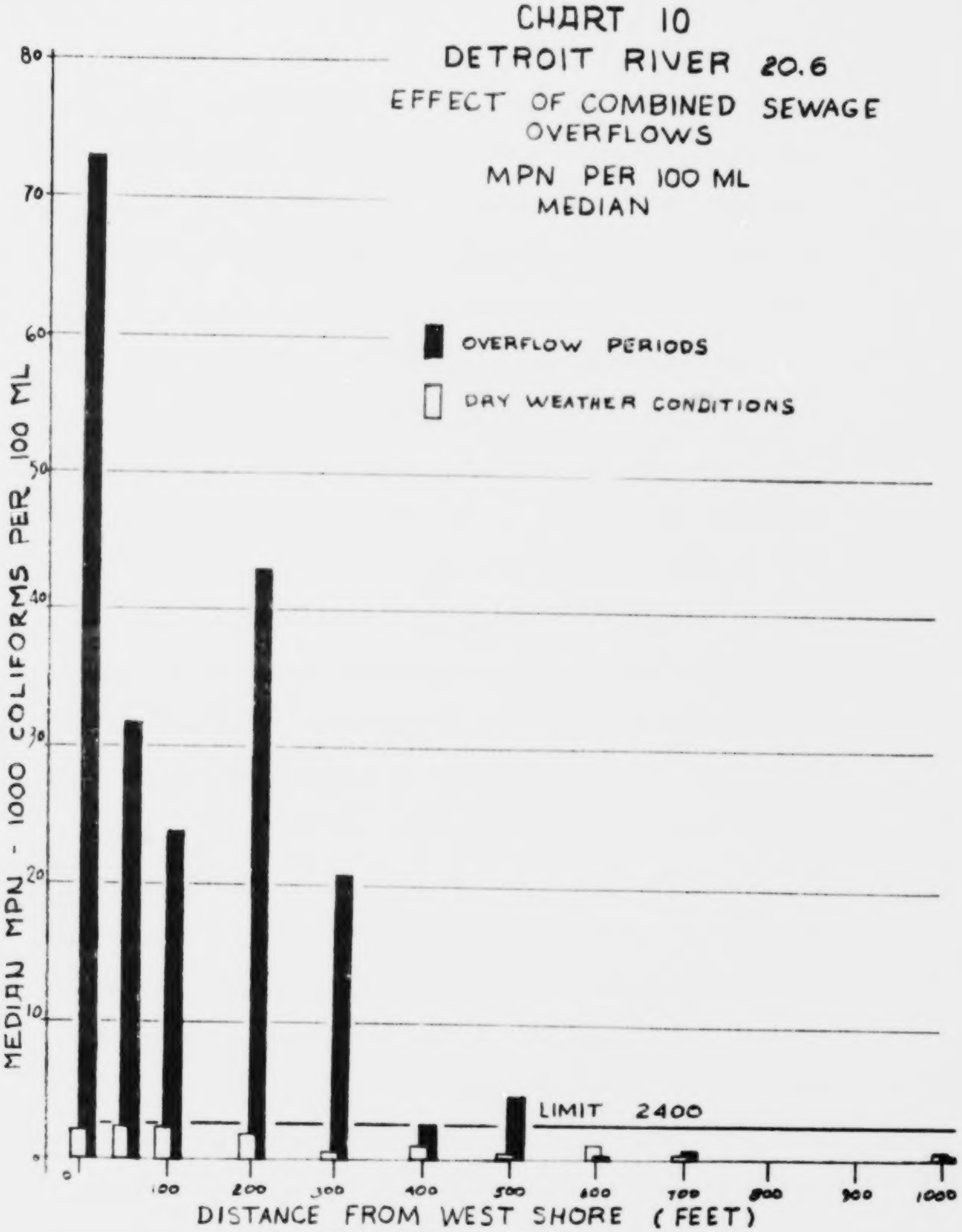

CHART 10
DETROIT RIVER 20.6
EFFECT OF COMBINED SEWAGE OVERFLOWS
MPN PER 100 ML
MEDIAN

1960 - 1961 SURVEYS
MICHIGAN WATER RESOURCES COMMISSION

During dry weather only one of the ten mean densities exceeded 2,400 per 100 milliliters. This mean MPN was 2,510 per 100 milliliters. The mean for all sampling points was 1,230 per 100 milliliters. The effects of the storm water overflows extended about 500 feet offshore at this range. Near the shore the average MPN rose to 73,000 per 100 milliliters. At four other points densities increased to: 21,000; 24,000; 32,000; and 43,000 per 100 milliliters. At 500 feet from shore the increase was from 320 during dry weather to 4,800 following the storms. The mean for all points following the storms was 20,100 per 100 milliliters or more than 16 times the dry weather mean. This demonstrates dramatically the problem that will remain, despite improved efficiencies of sewage treatment, so long as combined sewers pour raw sewage into the river from sewer overflows.

The following conclusions are limited to factors directly or indirectly affecting the United States waters of Lake St. Clair, the Detroit River, and the western end of Lake Erie. They do not include possible local pollution of tributary streams.

Although commendable progress has been made in sewage treatment since 1946-1948, further improvements are needed to minimize the hazards of excessive bacterial contamination. The more serious problems indicated by available data are the high densities of sewage bacteria throughout much of the Detroit River below Belle Isle which constitute a hazard to recreational uses, the excessive coliform content of the Wyandotte source of water supply, and the unsatisfactory bacterial quality of water at the Sterling State Park Beach. Major needs for improvement include elimination from the River Rouge of the unchlorinated Dearborn sewage discharge, more effective disinfection of the Detroit sewage plant effluent, provisions of sewerage systems with adequate treatment facilities for lake shore homes, especially in the Monroe area, and measures for reducing the effects of discharges of raw sewage from storm water overflows throughout the metropolitan area.

Additional investigation is needed to clarify other apparent problems. These include identification of the source or sources of occasional high coliform densities of the Mt. Clemens raw water and possibly of the Highland Park and Grosse Pointe Farms raw water; evaluation of the effect of untreated sewage from shore front homes; identification of the sources of bacterial contamination of the water along Sterling State Park Beach; and, accurate determination of densities of coliform bacteria in the Detroit Sewage Treatment Plant effluent.

PHENOLIC COMPOUNDS

There has been significant reduction in the problem of taste in municipal water supplies because of excessive phenolic pollution of sources of raw water, which caused concern at the time of the 1946-1948 study. Those responsible for the Detroit and Wyandotte municipal supplies report that there have been no occasions in recent years when phenolic content of the raw waters exceeded the capacities of their treatment facilities to prevent medicinal tastes in the water supplied to consumers. Occasional phenolic tastes still are detected in chlorinated raw waters, and Wyandotte uses special treatment methods to control the tastes. Data on phenols in Lake St. Clair and Lake Erie were not obtained for this report, and the operators of plants on these lakes were not interviewed on this subject.

Data for the Detroit River are somewhat conflicting, but indicate that phenolic materials still exceed the International Joint Commission objective.

The objective states that the concentration of phenol or phenol equivalents should not exceed an average of two parts per billion (p.p.b.) and a maximum of five p.p.b. after initial dilution of the wastes.

Data on average phenol concentrations at selected ranges in the Detroit River are presented on Chart 11.

(Chart 11 is as follows:)

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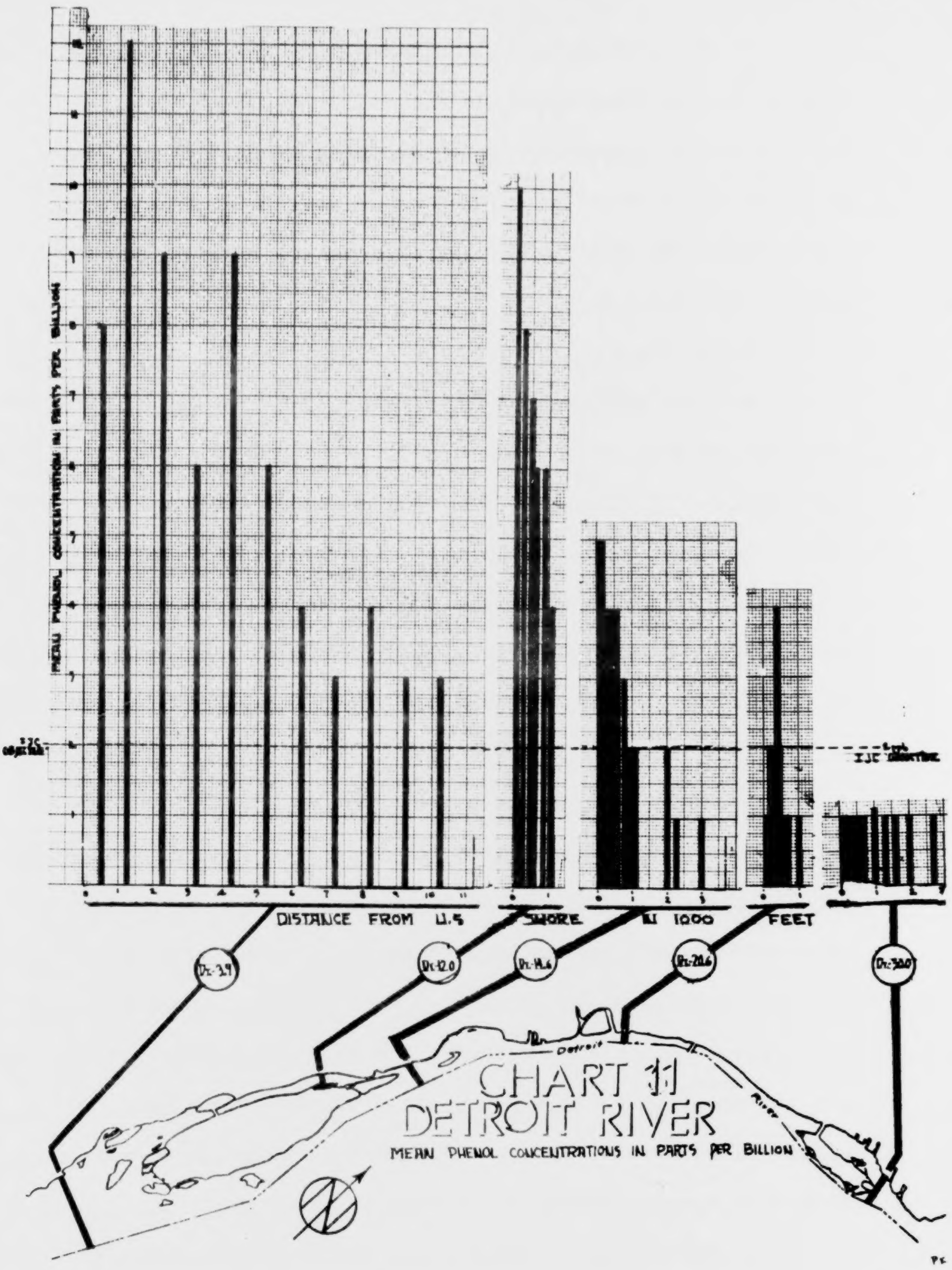


CHART 11
DETROIT RIVER
MEAN PHENOL CONCENTRATIONS IN PARTS PER BILLION

MR. KITTRELL: At Range SR 13.7, which incidentally is not on this chart, on the St. Clair River, the average phenol concentration at no point in American waters exceeded the average objective of two p.p.b. At one point a maximum value of seven p.p.b. exceeded the maximum objective of five p.p.b.

On Range Dt. 30.0, near the head of the Detroit River and just above the Detroit water plant intake, the over-all average of average values was one p.p.b. One maximum value of six p.p.b. slightly exceeded the maximum objective. The over-all average of maximum values was three p.p.b. In 1946-1948 the average was 3.8 p.p.b., and the average of maximum values was 15.6 p.p.b. Reduction of phenols at this range since 1946-1948 has been about 75 percent.

Range 20.6 is above the point of discharge of the Detroit Sewage Treatment Plant and the River Rouge. The recent average phenol concentration exceeded the average objective at only one of eight sampling points, with an over-all average of 1.8 p.p.b. The 1946-1948 average was 2.9 p.p.b. The recent average of maximum values was 6.8 p.p.b., compared to 31.4 p.p.b. in 1946-1948. A slight reduction in average values and a marked reduction in maximum values has occurred since the earlier period.

The Wyandotte water plant intake is just below

Range Dt. 14.6. Here the recent average phenols were 3.1 p.p.b., compared to 6.8 p.p.b. in 1946-1948. The recent average of maximum values was 16.8 p.p.b., compared to 16.0 in 1946-1948. The reduction in average values has been more than 50 percent, but the data indicate no improvement in maximum values, which represent the effects of slugs of phenolic substances. The improvement in taste of the Wyandotte treated water apparently reflects improved treatment methods rather than a marked reduction in phenol content of the raw water.

At Range 12.0, in Trenton Channel, recent average concentrations have been 6.5 p.p.b., compared to 15.6 in 1946-1948. The average of maximum values was 28.5 p.p.b., which represents a marked reduction from the 93.2 p.p.b. of 1946-1948.

The recent average at Range 3.9, near the mouth of the Detroit River, has been 5.2 p.p.b., which is only slightly less than the 7.3 p.p.b. average of 1946-1948. The 19.1 p.p.b. average of maximum values is slightly greater than that of 16.4 p.p.b. in 1946-1948. Sampling on this range was limited in both periods, and the data may not be adequate for valid comparison.

Consideration of all phenol data indicates that there has been a reduction in phenolic substances in the waters above the Detroit water plant intake, and above the

Detroit Sewage Treatment plant and Rouge River since 1946-1948. The evidence at ranges below this point is conflicting. At the Wyandotte water plant intake reduction in average phenols, but not in maximum values, is indicated. In the Trenton Channel the data indicate reductions in both average and maximum values. Near the mouth of the river the limited data available indicate little, if any, change in either average or maximum values since 1946-1948.

The water quality at the Detroit intake very nearly meets the phenol objectives and above the Detroit Sewage Treatment Plant and River Rouge exceeds the objectives only slightly. At the range just above the Wyandotte water intake the average objective is exceeded by about 50 percent, while the average of maximum values is a little more than three times the objective. In the Trenton channel the average is more than three times the objective and the average of maximum values nearly six times the objective. Near the mouth of the river the average is more than twice the objective and the maximum nearly four times the objective.

Despite the excess of phenolic substances over the objectives, they appear to have caused no taste problem in the Wyandotte treated water in recent years. Special water treatment methods, however, are necessary for prevention of medicinal tastes. The methods include use of chlorine dioxide.

No reports have been received of phenolic tastes in the flesh of fish taken from the Detroit River.

OIL

It is impractical to measure oil in large streams, and no quantitative data on oil in the waters of the Detroit area are available. Evaluation of the oil pollution problem can be based only on reports of visual observations, and on reported evidences of the effects of pollution.

Previously in this report it was noted that the Water Resources Commission river patrol reported evidence of significant oil leaks or spills to the Detroit River on 36 occasions between June 30, 1960 and January 5, 1962. Fifteen of these originated in steel plants and fifteen others were evenly distributed among municipal sewers, automobile plants, and coal distillation process plants.

One dramatic effect of oil pollution is its effects on ducks. Oil can cause the death of ducks in several ways. The oil coats their feathers and they become waterlogged, lose their ability to fly, and may drown. Oil also breaks down the feathers' insulating capacity, and the ducks may freeze to death. Ducks covered with oil do not eat normally and may starve to death. The ducks attempt to preen oil off their feathers, and may ingest toxic materials that cause their death.

There have been a number of duck kills over the years that were attributed to oil pollution. Forty-four per cent of all dead ducks collected between 1948 and 1955 had oil on their feathers. The oils found on the ducks were of the ordinary refined, lubricating types, indicative of industrial sources. Data are not available on total numbers of ducks killed by oil pollution during 1948 to 1955, but it is indicated that oil has been a significant factor in duck mortality during that period.

From 1956 through 1959 duck mortalities were small. In March 1960, however, an estimated 12,000 ducks died in the lower Detroit River. Infrared spectroscopic analyses of oil from the feathers of dead ducks indicated that the oil was a glyceride type found in both municipal sewage and certain industrial wastes. At that time raw sewage was being bypassed to the Detroit River and tributary streams from several sources. The City of Detroit was diverting about 80 million gallons per day from the Northwest interceptor to the River Rouge while a section of this interceptor was being rebuilt. For a similar reason the Wayne County Road Commission was bypassing about four million gallons per day to Ecorse River. There were combined sewer overflows from Oakwood, Miller Road, and Dearborn West Side, and the Wyandotte pumping station. Although the evidence was only circumstantial, representatives of the Water Resources Commission concluded that sewage was the most likely source of the oil and grease.

Oil pollution contributes to the fouling of boats, necessitating laborious cleaning and repainting. On at least one occasion in the last few years an industrial oil spill resulted in the fouling of a large number of boats which are reported to have been cleaned and repainted at company expense.

Oil tends to accumulate in eddies along the river bank, and on becoming mixed with other floating debris presents a most unpleasant appearance which destroys the aesthetic appeal of the water. Such pockets of oily scum are evident from time to time at various points along the Detroit waterfront. Sections of the banks of the River Rouge are coated with black oil deposits for several feet above normal water level, and oil floats on the surface of this river in some areas.

Although good progress has been made in the control of oil pollution further reduction in this type of pollution is needed. Greater precautions against oil spills and leaks in industrial plants is an especial need.

SUSPENDED SOLIDS

No data on suspended solids in the area's waters were obtained for this report. The effects of the solids may be apparent as discoloration of the watercourse for various distances below the points of discharge. The effects also may be reflected in the types and numbers of aquatic organisms found on the bottom of the receiving waters.

An industrial plant on the Trenton Channel is faced with a difficult solids control problem. Finely dispersed iron particles in the wastes discolor a section of the Detroit River for many miles downstream, and are reported to have persisted into Lake Erie before being dissipated. There have been complaints by downstream boat owners that the solids settle close to shore and make it difficult or even impossible to launch boats through the resulting deposits. The company has attempted several treatment methods at considerable cost, but has not achieved a solution of the problem.

Available biological data indicate that organic suspended solids have settled to the bottom of the lower Detroit River and seriously altered the species of bottom organisms on which fish feed. Chart 12 illustrates the results of a bottom organism survey by a biologist of the Water Resources Commission. The survey extended from Range Dt. 20.6, above the Detroit Sewage Treatment Plant and the River Rouge, downstream to Range Dt. 3.9.

(Chart 12 is as follows:)

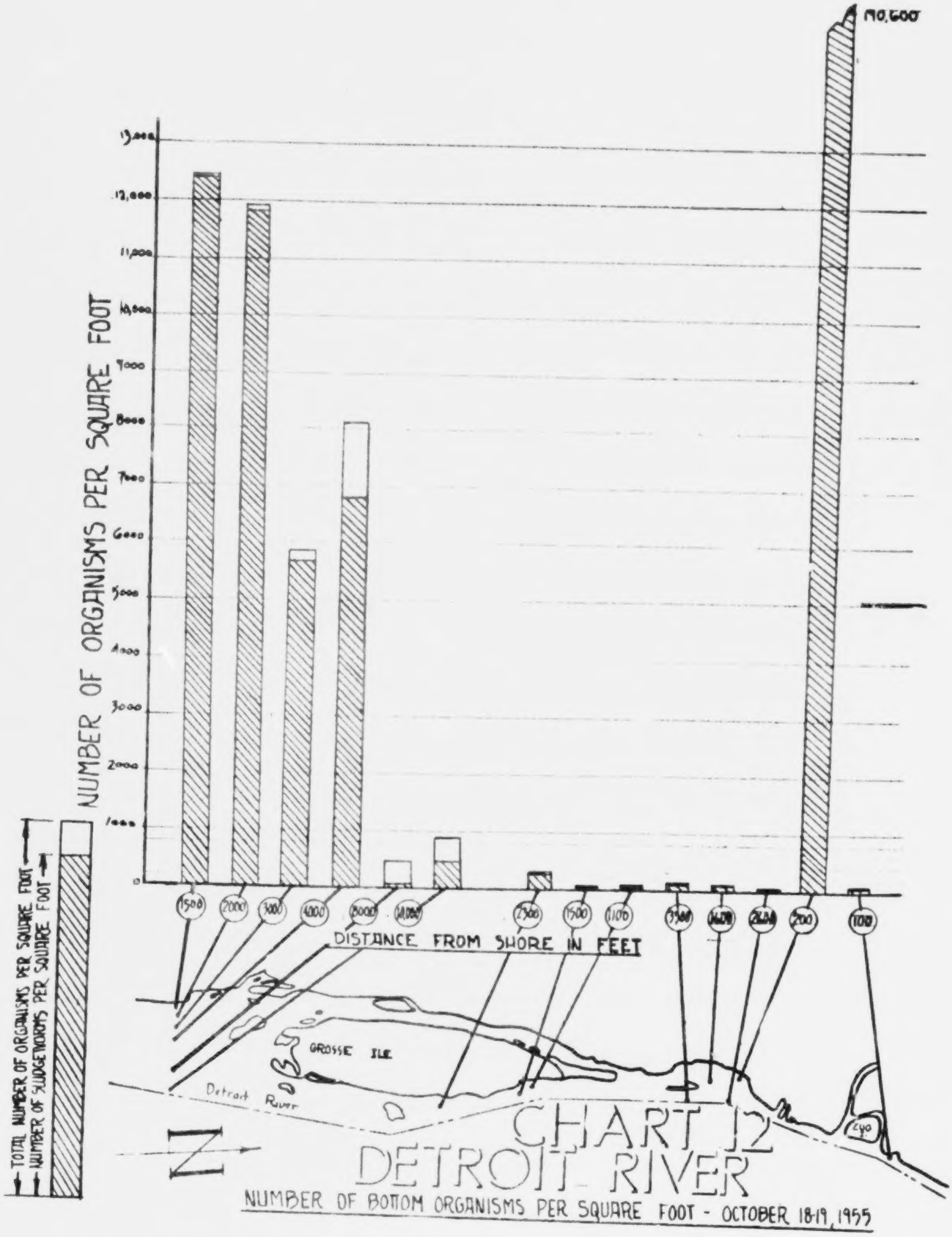


CHART 12
DETROIT RIVER
NUMBER OF BOTTOM ORGANISMS PER SQUARE FOOT - OCTOBER 18-19, 1955

Total bottom organisms were relatively low in and near the channel from Range Dt. 20.6 downstream to a point east of the middle of Grosse Ile. The total numbers in this reach were about 100 or less per square foot, with one exception. Near the shore a short distance above Ecorse River a mass of sludge worms, numbering 190,600 per square foot, was found. These worms, indicated by the dark portions of the bars on Chart 12, typically are found living on sludge deposits formed by the settling of organic suspended solids. Dense populations of the worms invariably are associated with pollution of stream bottoms by organic matter. It is noteworthy that at least a portion of bottom life at all points consisted of these worms. At Range Dt. 3.9, where water velocities are lower and suspended solids settle more readily, the worm populations generally were high. Two counts of several hundred bottom organisms were found at distances of 8,000 and 10,000 feet from shore. Significant portions of the aquatic organisms at these two points were species other than sludge worms. At the four sampling points within 4,000 feet of shore, however, the sludge worm counts were in the thousands, varying from a little less than 6,000 to more than 12,000 per square foot and other species represented only minor portions of the total counts. The presence of quantities of organic sludge is evidenced by the preponderence of sludge worms at the four inshore sampling points.

All of the primary sewage treatment plants discharging to the Detroit River, the Dearborn plant discharging to the River Rouge, and storm water overflows, contribute to the sludge deposits in the lower Detroit River. Industrial wastes discharged to the Detroit River and to the River Rouge account for approximately as much suspended solids as do the sewage treatment plant effluents. These suspended solids also contribute to the sludge deposits.

Further investigation of the sludge deposits are needed. If the investigation reveals that the sludge deposits are as abundant as is indicated by the sludge worms, the sewage and industrial sources of the deposits should be identified more specifically. Identification of the industrial sources of organic solids especially is needed, because of the lack of recent data in some cases, and because suspended solids from a number of industrial plants are inorganic rather than organic.

B. O. D.

B.O.D. has been used as one means of characterizing sewage and industrial wastes in the section on sources of wastes in this report. It is not, however, considered as a significant factor in evaluating effects on water quality and uses in Lake St. Clair, the Detroit River, and western Lake Erie. There is no evidence that B.O.D. of any of the wastes causes significant oxygen depletion of these waters.

There is serious local oxygen depletion in some of the tributary streams, notably the River Rouge and the Clinton River. In the former, especially, total depletion of oxygen occurs for many weeks each summer. Evaluation of the conditions of the tributaries, except as they may influence the principal waters under consideration, is not within the province of this report.

AMMONIA

Only one effect of ammonia on water use is evident in the data obtained for this report.

The Wyandotte water treatment plant employs chlorination to a free residual as one important measure of protection against the excessive bacterial contamination of the raw water. Any ammonia present in water must be converted to nitrogen trichloride or oxidized to free nitrogen by chlorine before a free chlorine residual can be obtained. As concentrations of ammonia increase, correspondingly large dosages of chlorine must be applied to assure attainment of the desired free chlorine residual.

The effect of ammonia on chlorine used at the Wyandotte water plant is apparent in a comparison of the chlorine dosages employed at the Detroit and Wyandotte water treatment plants. Chart 13 shows monthly average chlorine dosages and residuals for both plants in 1961.

The dark area on the chart for each plant represents the difference between chlorine dosage and residual. This difference is the chlorine consumed.

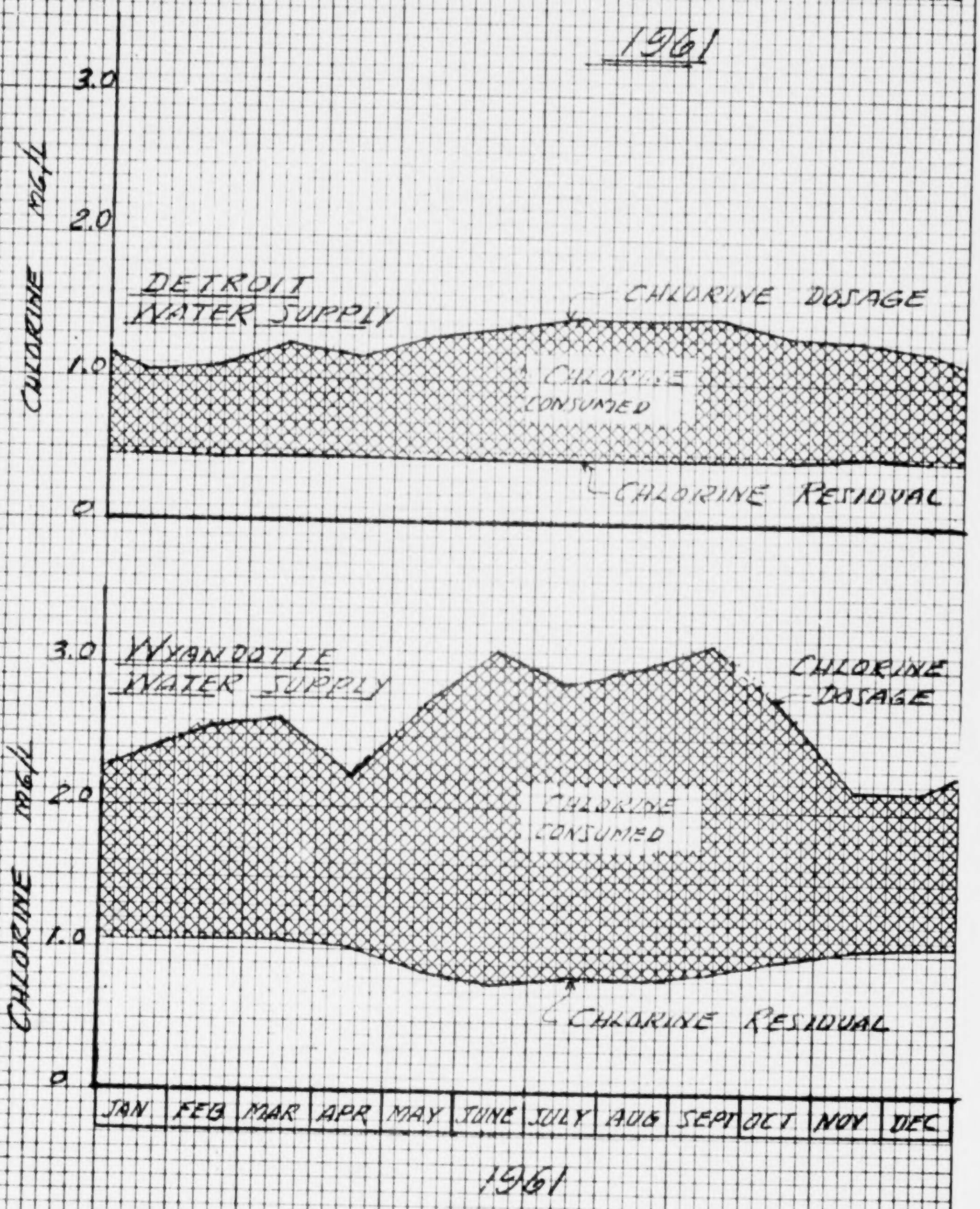
The Detroit plant used an average chlorine dosage of 1.28 milligrams per liter, to obtain an average residual of 0.46 milligrams per liter in 1961. The average chlorine consumed was 0.82 milligrams per liter. The Wyandotte plant applied an average dosage of 2.64 milligrams per liter to obtain an average residual of 0.94 milligrams per liter. The average chlorine consumed was 1.70 milligrams per liter, or a little over twice the chlorine consumed by the Detroit raw water. Also, the chlorine residual maintained at the Wyandotte plant to control bacterial contamination and tastes was double the residual maintained at the Detroit plant.

Possibly constituents other than ammonia contribute in a minor degree to the chlorine consumption of the Wyandotte raw water, but ammonia undoubtedly is a factor. Available evidence indicates that the ammonia is principally from the Detroit Sewage Treatment Plant effluent and from natural sources, with minor quantities from industrial plants discharging wastes to the River Rouge and the Detroit River above Wyandotte.

(Chart 13 is as follows:)

CHART 13

CHLORINE CONSUMED
of
DETROIT RIVER WATER
1961



MISCELLANEOUS FACTORS

Several other possible causes of pollution of the Detroit River have been examined. All indicate some effects of sewage and wastes discharged in the Detroit area.

CARBON FILTER CHLOROFORM EXTRACTABLES

Carbon filters have been operated on the raw waters at the Detroit and Wyandotte water plants for several years. The chloroform extractable materials accumulated on the carbon are an index of certain trace organic constituents of the water, including some that cause taste and odor.

The median value of chloroform soluble organics at the Detroit water plant was 30 p.p.b. in 1961, with a maximum of 42 p.p.b. Comparable values at the Wyandotte plant were 60 and 107 p.p.b. The sewage and industrial wastes discharged to the Detroit River and tributaries above Wyandotte doubled the median value for the Wyandotte raw water and increased the maximum value by 2.5 times that of the Detroit plant.

CHLORIDES

Chlorides at the head of the Detroit River average about seven milligrams per liter. Near the mouth of the Detroit River average chlorides increase to about 20 milligrams per liter, or nearly three times the concentration above Detroit. Sewage contributes to this increase, but the principal sources probably are two soda ash plants in Detroit. Chlorides as high as 90 milligrams per liter have occurred in the source of water for plants situated along the lower Detroit River and have caused problems in processing water for boiler feed.

HARDNESS

The hardness of the raw water at the Highland Park water plant in Lake St. Clair averaged 102 milligrams per liter during December, 1960, through November, 1961. The average hardness of the raw water at the Monroe water plant in Lake Erie during the same period was 125 milligrams per liter. This indicates a hardness increase of 23 milligrams per liter, probably attributable to industrial wastes discharging to the Detroit River and tributaries. The two soda ash plants and other industrial plants using large quantities of lime probably were the principal contributors to the increase in hardness. The increased hardness requires additional quantities of soap and other detergents, for household use, and causes other less tangible effects in domestic use of the water. It also adds to the cost of water softening for industrial use.

IRON

Waste pickle liquor from steel manufacture contains high concentrations of sulfuric acid and iron. No serious effect of the large quantities of acid involved on the huge natural alkalinity resources of the Detroit River has been demonstrated. Once the acidity is neutralized, however, the iron is precipitated as fine orange to brown particles. These suspended particles discolor the water for variable distances below points of pickle liquor discharge, and decrease the aesthetic appeal of the water. The iron also discolors boat hulls and structures, such as bridge piers, submerged in the water.

RADIOACTIVE WASTES

There are several important users of radioactive materials and radioisotopes in the Detroit area. The waste disposal practices of the more important users were investigated and the records of water monitoring in the area were reviewed. The waste disposal facilities and practices that were examined appeared to be adequate to prevent significant contamination of receiving waters. The results of water monitoring confirmed the fact that radioactive pollution of waters of the area is not a matter for concern.

SUMMARY AND CONCLUSIONS

A survey of pollution of the navigable intrastate portions of waters of Lake St. Clair, the Detroit River, and the western end of Lake Erie in the Detroit area was made during January and February, 1962, by personnel of the Public Health Service, Region V Office, and the Robert A.

Taft Sanitary Engineering Center. Existing information and data on sources of pollution, water uses, water quality, effects of pollution on quality, and damages and hazards to water uses were assembled and evaluated.

A continuing campaign to control pollution of these waters has been waged by state and local agencies, and material progress has been achieved in the provision of sewage and industrial waste treatment and control measures. Despite these achievements, however, adverse effects of pollution persist and additional control measures to protect the priceless water resources of the area are imperative.

The source of municipal water supply for the people of Wyandotte is subjected to contamination by upstream sewage treatment plant discharges and by storm water overflows which introduce raw sewage to the river. The resulting excessive bacterial contamination poses an ever present threat to the safety of the treated water. Ammonia and other chlorine-consuming compounds discharged upstream cause rapid fluctuations in chlorine demand which require continuous vigilance and special treatment facilities to assure production of safe, potable treated water. A special treatment process is required to control phenolic tastes.

Recreational users of the waters below Belle Isle are exposed to the health hazards of excessive bacterial contamination. Swimming is not permitted along the Detroit waterfront, below Belle Isle, and Sterling State Park Beach has been closed because of bacterial contamination. Down river recreational development is handicapped. Despite the health hazards involved, thousands of pleasure boaters and hundreds of water skiers use the waters of the lower Detroit River. Sections of the waters along the shore lines of St. Clair, Macomb, Wayne, and Monroe counties probably are rendered hazardous by the discharge of raw or inadequately treated sewage from shore homes. Raw sewage from more than a hundred storm water overflows throughout the area adds to the hazards of bacterial contamination, and produces visual nuisances on the surface of the waters.

Oil from industrial sources, some probably transmitted through municipal sewers, has killed ducks from time to time, fouled boats, and caused unsightly scum on the water in scattered areas. Most of the oil pollution apparently results from oil leaks and spills. Phenols still exceed the limiting objectives that have been established, especially in the lower Detroit River. High densities of sludge worms on the bottom of the Detroit River in some areas indicate the existence of organic sludge deposits, and the replacement of desirable bottom life with pollution tolerant forms. Suspended solids cause changes in appearance of the water below certain sewage and industrial waste discharges which diminish the aesthetic appeal of the water.

Calcium chloride and lime wastes increase the hardness of Detroit River water by more than 20 percent, and chloride wastes have caused problems in processing water for boiler feed. The iron in waste pickle liquor discolors the water and coats boat hulls and submerged structures below points of discharge.

The need for certain improvements is obvious, but others probably should await further investigation. The Dearborn raw sewage and the unchlorinated primary effluent should be eliminated from the River Rouge as rapidly as possible. Improved bacterial control is needed at the Detroit Sewage Treatment plant. The Wayne County and Trenton sewage treatment plants are badly overloaded, and should be expanded, with the inclusion of improved means of bacterial control. Shore front communities in all four counties with water frontage should provide community sewerage systems with adequate treatment. Positive thinking leading to a positive approach to the problem of minimizing storm water overflow effects should be initiated. The precedent established by the installation of storm water overflow treatment plants, providing sedimentation and chlorination, at Farmington and in the Milk River Drainage District, may constitute an important step in this direction. More attention should be devoted to prevention of oil spills and leaks by industry.

Some of the problems requiring further study are obvious. Studies of all important sources of industrial wastes should be undertaken so that evaluation of any effect of pollution attributable to each can be made and acted upon. The over-all effects of storm water overflows, as compared with and superimposed upon the effects of continuous discharges of treated effluents, should be evaluated. The extent and nature of sludge deposits and their impact on bottom organisms which serve as a link in the fish food chain should be investigated. The sources of bacterial contamination of the water along Sterling State Park Beach should be identified, so that correction may be made and the beach reopened as soon as possible. This involves special quantitative study of the possible fecal nature of coliform bacteria in the wastes of the strawboard mill at Monroe. The effects of sewage from shore front homes on bacterial quality of water along the private beaches and adjacent areas should be investigated. More thorough evaluation should be made of the effects of chlorides, hardness, and waste pickle liquor on water quality and uses. The impact of pollution of the Detroit

River on water quality in Lake Erie should be determined.

It is obvious that pollution of the United States waters of Lake St. Clair, the Detroit River and the western end of Lake Erie constitutes pollution of navigable intrastate waters subject to enforcement under the provisions of the Federal Water Pollution Control Act (33 USc 466, etc.), as such pollution causes hazards to health or welfare of persons using these waters.

THE CHAIRMAN: Thank you, Mr. Kittrell.

(Applause.)

THE CHAIRMAN: Do we have any comments or questions from the conferees?

DR. HEUSTIS: No.

MR. LIDDLE: No.

MR. POSTON: No.

THE CHAIRMAN: I have just one question I would like to ask Mr. Rademacher or Mr. Kittrell, or both, to correct me if I am wrong on this, but as I listened to this report today it seemed to me that in large measure some type of treatment was being provided by both the municipalities and the industries. Is that correct?

MR. KITTRELL: That is true, in most cases.

THE CHAIRMAN: In most cases. And since this is so, and assuming that -- not hearing the rest of the statement here yet -- if damages to water uses are occurring, with this treatment, I think we possibly have before us a very subtle and relatively sophisticated problem. In many areas of the country you will find no treatment at all was provided; that the municipalities, or the industries, are pouring their wastes in raw, and the solution there is relatively simple; that is, you ask these people to provide treatment and obviously then you are going to get some pretty startling results and improvements.

However, in Detroit, without drawing any conclusions here, you may very well be in the situation that a lot of large communities find themselves in, where you have and are providing and have done a lot of work in this regard; where you have had plans for treatment and they have executed these plans, and you still may have conditions existing which may not be desirable. In this type of situation, I think we are faced with a problem where we have to use the utmost scientific and administrative discretion because some of these municipalities and industries may be providing an adequate measure of treatment now while some may need more, and that a differential diagnosis may be what is called for. If that is the situation here, I think this may call for some real statesmanship on all our parts.

I have one more question. I know you did not do any studies here, but there was no work done on fecal coliforms or fecal streptococci at all, was there?

MR. KITTRELL: I haven't found any data on fecal streptococci.

THE CHAIRMAN: Would you or would you not care to call on Mr. Clark, if he is here, to indicate if that kind of work may give us an indication, or a further indication of what might be the problem in this area?

MR. KITTRELL: I would like to have Mr. Clark speak to us on this point.

THE CHAIRMAN: Mr. Clark, would you mind coming up? I think while Mr. Clark is coming up there is in this report, as I have heard it here today, one area which is significant by its absence. Mr. Clark in recent years has developed a technique of tracing sewage bacteria downstream, and as far as I can see he can almost fingerprint them, and tell you where they come from -- whether from warm-blooded animals, or human beings, or a processing plant, and how far upstream they came from. This has not been covered here, and I wonder if you can briefly, Mr. Clark, outline the objectives of the technique and whether you think that might be effective in this area in illuminating the problem?

STATEMENT OF HAROLD F. CLARK, BACTERIOLOGIST, RESEARCH BRANCH, DIVISION OF WATER SUPPLY AND POLLUTION CONTROL.

MR. CLARK: Yes, sir. For the record my name is Harold F. Clark, Bacteriologist, in Charge of Water Forms and Studies, Research Branch, Division of Water Supply and Pollution Control.

We have for quite a whilebeen studying the separation of fecal from the known fecal coliform. The procedure consists of a correlation of the presumptive positive tests in various media at 44.5 to 45.0 degrees Centigrade. I won't try to go into the technical details further except to state that we have studied some 10,000 primary isolates from humans and animals and in all those we have found that 97 percent of all those isolated from the gut of warm-blooded animals gave this positive reaction. It gives better than a 96 percent constant level as to their source.

On the other hand, we have studied from five to ten thousand strains of coliforms that are isolated from soils which, according to our sanitary engineering inspection reports contain no known sources of fecal pollution. In those instances we found less than four percent of these coliforms gave you a positive reaction.

In a statistical calculation we get a little bit better than a 99 percent correlation of fecal organisms with a fecal source, and the non-fecal organisms with the absence of any fecal source.

THE CHAIRMAN: In other words, Mr. Clark, let me see if I can translate this for my own use. Generally speaking in a stream, in examining these organisms, that is, the fecal streptococci and the fecal coliforms, you can tell if they came from fecal sources of warm-blooded animals; and in determining the stream flow and other conditions you have been pretty generally successful in pinpointing where they came from?

MR. CLARK: If these procedures, Mr. Stein, are applied to a stream and its organisms that gave positive reaction, I am willing to swear to it it is a fecal source and fecal organism.

THE CHAIRMAN: In view of what I think might possibly be some areas where we need some more particularity on the Detroit River, do you think that studies of that type would be useful in determining where the fecal sources of contamination were coming from, and how far they persisted downstream?

MR. CLARK: If I were going to set the survey up for this area I would certainly recommend three test procedures: The total coliform test, as has been reported here today; the fecal coliform test as a supplement to the total coliform test to be able to pinpoint the coliforms that come from actual feces as contrasted to those that might come from soil erosion; and, I would also insist that the fecal streptococci test be run, and that a sufficient number of species identification be performed in certain specified samplings on the strain type or species type of streptococci to be able to indicate a possible source from which those streptococci were derived.

THE CHAIRMAN: Are there any further questions?

DR. HEUSTIS: May I ask you a question? I am familiar in general with the routine laboratory procedures, Mr. Clark, but this special testing and this special tracking down you mentioned -- in your opinion, is this still in the area of research, or is this a practical procedure that any good laboratory could carry out?

MR. CLARK: In my opinion, sir, it has passed the stage of research and is now an applied test that can be used in routine stream investigations.

DR. HEUSTIS: Is it being so applied, sir?

MR. CLARK: We have used it in a number of studies. We used it in the Missouri River studies at Sioux City and St. Joe; at Kansas City down the Missouri River to St. Louis; and we have used it in the North Platte River studies, and a lot of other studies.

DR. HEUSTIS: Have other investigators used it and come up with similar results, or is the experience limited to your laboratory?

MR. CLARK: According to the literature other investigators have used it and they have come up with similar results.

DR. HEUSTIS: Thank you, sir.

MR. CLARK: In fact, the English tests on fecal coliforms used by the Metropolitan Water Board of London is very similar to the test we have developed, although we think ours has a little greater sensitivity than theirs and is a little more restrictive. Also, most of the countries of Europe accept the fecal coliform test on their drinking water rather than the total coliform test, although I am categorically opposed to such a procedure for potable water.

THE CHAIRMAN: Are there any further questions of Mr. Clark? If not, thank you very much, Mr. Clark.

A statement prepared by Mr. Clark will be made a part of the record at this point.

(The Statement is as follows:)

BACTERIOLOGICAL EXAMINATION OF STREAM SAMPLES

Microbiology
Water Supply and Pollution Control Research
Robert A. Taft Sanitary Engineering Center
U.S. Department of Health, Education and Welfare
Public Health Service
Cincinnati, Ohio

Introduction to Methodology

The standard tests for the coliform group described in Standard Methods for the Examination of Water and Wastewater, 11th edition, 1960 (1) are designed specifically for the quantitative determination of the coliform group. The coliform group includes all the aerobic and facultative anaerobic, non-spore-producing, gram-negative rods which ferment lactose with gas production within 48 hours at 35 (plus or minus 0.5)°C. The standard tests are:

1. Presumptive Test (based on gas production from lactose) in which a negative reaction excludes the coliform group and a positive test indicates that coliform bacteria may be present.
2. Confirmed Test which demonstrates gas production from lactose in the presence of bile salts and brilliant green or the production of nucleated (with or without sheen) or opaque, mucoid, unnucleated colonies confirms the presence of the coliform group, using Eosin Methylene blue agar or Endo agar plates.
3. Completed Test in which the coliform bacteria is isolated in pure culture and demonstrated to produce gas from lactose as well as consisting of gram-negative rods consistent with the morphology of the coliform group. This is the coliform reference test for the multiple tube procedure in Standard Methods (B.3. page 499).
4. Membrane Filter Technique consisting of filtration of the sample through a membrane filter,

cultivation of the coliform colonies on the filter surface using the Standard Methods (12. page 488) M-Endo Medium and counting coliform colonies for a "coliform colonies" count.

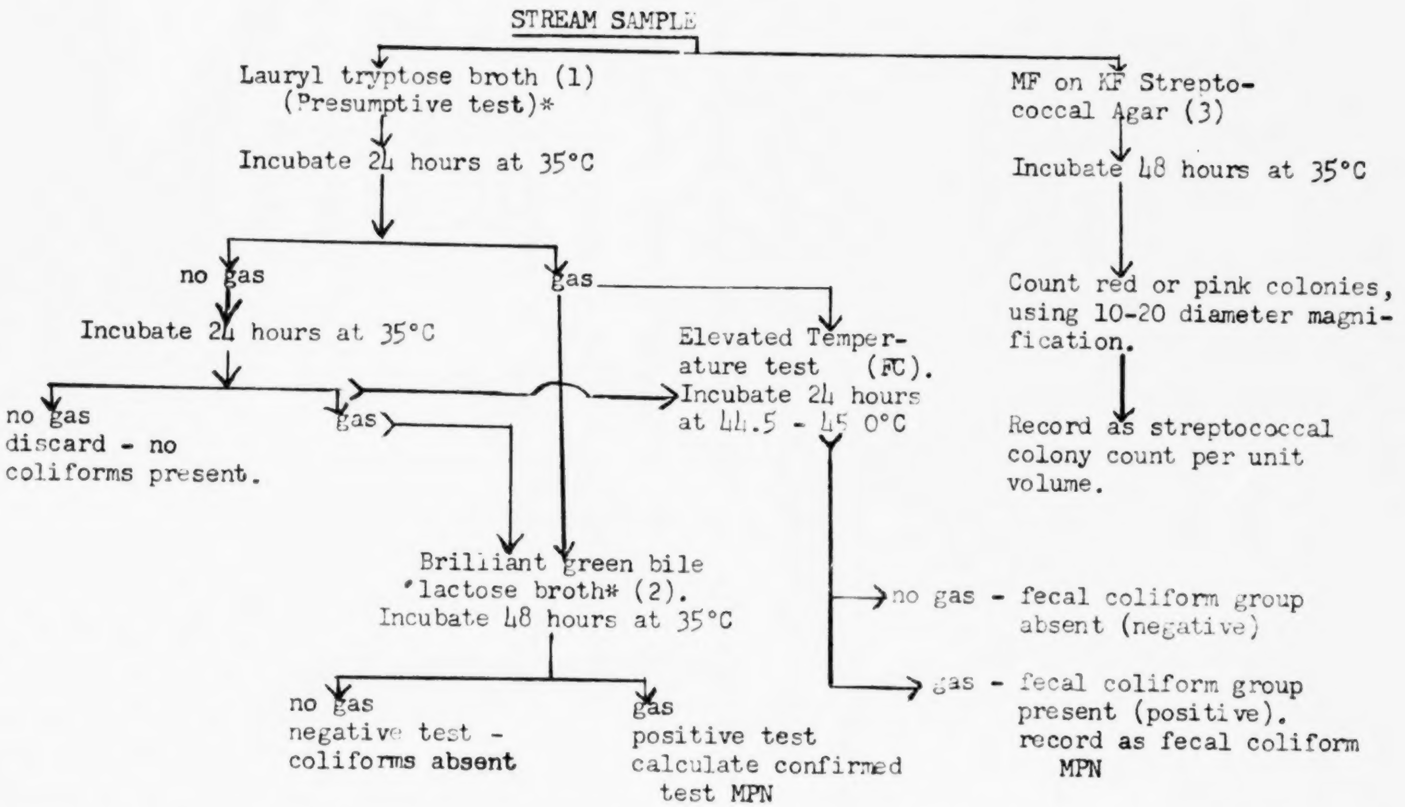
The above Standard Methods procedures, by not distinguishing between the various types of coliform bacteria composing the coliform group, yield no information as to their possible source or origin. A group of tentative differential tests is described but no suggestions are given as to their interpretation other than such procedures seldom give sufficient information to justify the labor and time required for the procedures. Presence or absence of the coliform group is all that is necessary in the bacterial examination of a potable water and the standard tests are adequate for this purpose (2).

The objectives in the bacteriological investigation of untreated surface waters, such as used in a stream survey, must go beyond the procedures described in Standard Methods. Bacteriological objectives include the quantitative estimation of all indicator microorganisms of pollution so that as much information as to the probable sources and significance can be collected as is consistent with accepted bacteriological research methods and practices.

In the accomplishment of these objectives, it is necessary to use newer research methods which are beyond the scope and objectives of the procedures in Standard Methods. The testing methods include the elevated temperature test which indicates the fecal or non-fecal origin of coliform bacteria and the streptococcal method as an indicator of pollution. Both of the procedures and their interpretation have been established by detailed research investigations on the distribution of indicator microorganisms in feces as well as in other environments (3, 4, 5, 6, 7, 8).

Methods of Examination

Bacteriological procedures used in the examination of stream samples are shown in the following schematic diagram. Procedures which are marked with an asterisk are described in Standard Methods while unmarked methods represent tests not described and are the product of recent research studies.


STREAM SAMPLE
Lauryl tryptose broth (1)
(Presumptive test)*
Incubate 24 hours at 35°C
no gas
Incubate 24 hours at 35°C
no gas
discard - no
coliforms present.
gas
gas
Elevated Temperature test (FC).
Incubate 24 hours
at 44.5 - 45 0°C
Brilliant green bile
lactose broth* (2).
Incubate 48 hours at 35°C
no gas
negative test -
coliforms absent
gas
positive test
calculate confirmed
test MPN
no gas - fecal coliform group
absent (negative)
gas - fecal coliform group
present (positive).
record as fecal coliform
MPN
MF on KF Strepto-
coccal Agar (3)
Incubate 48 hours at 35°C
Count red or pink colonies,
using 10-20 diameter magni-
fication.
Record as streptococcal
colony count per unit
volume.

* Indicates procedure described as standard test in Standard Methods for the Examination of Water and Wastewater, 11th ed. (1960).

(1). Lactose broth may be substituted for lauryl tryptose broth.
(2). Eosin Methylene blue or Endo agar may be substituted for the brilliant green bile lactose broth.
(3). The KF Agar pour plate count may be used interchangeably with the MF colony counting technique.

Discussion of Tests

Stream samples are collected and examined for the coliform group according to the procedures described in Standard Methods. These procedures include the use of lauryl tryptose broth for a screening test and confirmation of the presumptive positive tubes in brilliant green bile lactose broth. This is considered preferable to the lactose broth option in the presumptive test and the Endo or Eosin-Methylene Blue plate options in the confirmed procedure. The "Confirmed Test" enumerates the coliform group in the sample but yields no information as to probable source, such being derived from feces, soil, plants, etc.

Elevated Temperature Test (EC)
at 45°C

The procedure for the Elevated Temperature Test consists of the following steps:

1. Transfer a loop of broth from the positive presumptive tube to an EC broth tube containing an inverted vial to indicate gas production.
2. Place the inoculated EC tube, within less than 30 minutes after planting, in a water bath at 44.5 - 45.0°C.
3. Incubate at 44.5 - 45.0°C for 24 (plus or minus 2) hours in water bath.
4. Record the presence or absence of gas in

the inverted vial.

The presence of gas in the inverted vial is a positive reaction indicating that coliforms derived from the gut of warm-blooded animals (fecal coliforms) were present in the sample. Absence of gas indicates the absence of fecal coliforms in the tube since the members of the coliform group derived from non-fecal sources generally fail to produce gas in this medium at 44.5 - 45.0°C. The fecal coliform density is calculated on the number of positive and negative tubes in the series in the same manner as for the coliform group MPN.

Streptococcal Colony Count

Streptococcal enumerations are made by the membrane filter technique using KF Streptococcus Agar as nutrient substrates. The medium is prepared as follows:

1. Mix 7.64 grams of KF Streptococcus Agar (Difco 0496) with 100 ml sterile distilled water in a sterile flask.
2. Place the flask containing the mixture in a boiling water bath to dissolve the medium containing the agar.
3. After solution is complete, continue heating in the boiling water bath for five (5) minutes.
4. Cool medium to between 50 - 60°C.
5. Add one (1) ml of sterile aqueous solution of

one (1) percent TTC (triphenyl-tetrazolium chloride)* solution and mix.

6. Pour from 5 - 8 ml of melted medium in each sterile plastic petri dish (Falcon No. PD5012) and replace lid until medium hardens.

The medium is ready for immediate use or may be used at any time within 30 days, provided it is stored in a dark place and no evaporation has occurred during storage.

The procedure for the test consists of:

1. Filter an appropriate quantity of sample through the membrane filter.

2. Place Filter on KF Streptococcus Agar, grid side up, using care to have no air bubbles between the membrane filter and agar surface.

3. Incubate at 35°C for 48 hours (up to 72 hours is permissible).

4. Count all red or pink colonies, using a magnification of 10 - 20 diameters. Orange, yellow, white or other colonies with other colors, except red or pink, should not be counted since such types have not been observed in fecal examination.

5. Calculate count per unit volume as streptococcal colony count per unit (usually 100 ml or 1 ml) volume.

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* 2,3,5-triphenyl-tetrazolium chloride No. 6533, Eastman Organic Chemicals, is recommended. Do not autoclave solutions of this compound.

The group of streptococci which meet the above definition are always found in feces and has little or no ability to produce after-growth in the stream. They are present in greater numbers than the coliform group in the feces of most domestic animals, while the coliform group outnumber the streptococci in human excreta.

Fecal streptococci, like the fecal coliform group, is interpreted to indicate fecal pollution. As the numbers of the indicators increase, the quantity of fecal pollution increases. However, each should be considered as an independent indicator of pollution. Survival rates of each group vary under any specific environment and may vary greatly from environment to environment. Conditions may exist where one or the other indicator may die at a greatly accelerated rate.

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THE CHAIRMAN: Mr. Poston.

MR. POSTON: No questions.

THE CHAIRMAN: No. I mean are there any other statements? We are ready to proceed.

MR. POSTON: At the time of making preparations for this conference we wrote letters to other Federal agencies in this area asking them or telling them of the conference and inviting them to make comments or a statement at this conference, that is, a statement of their interest in this field that is under study at the conference.

Colonel Robert C. Pfeil, District Engineer of the United States Corps of Engineers is here today to make a statement for the Corps of Engineers. Colonel Pfeil.

STATEMENT OF COL. R. C. PFEIL, UNITED STATES CORPS OF ENGINEERS.

COL. PFEIL: Mr. Stein, Mr. Poston, and members of this conference, and ladies and gentlemen:

I will read this statement dealing with the responsibility and interest in control and prevention of pollution in Detroit River.

The Corps of Engineers has certain responsibilities in the field of pollution control and abatement in conjunction with the primary civil responsibilities for navigation improvements and river basin development. The Federal interest in navigation projects stems from the

Commerce clause of the Constitution which provides that Congress shall have the power"to regulate commerce with foreign nations and among the several States, and with the Indian Tribes." The Federal interest has gradually expanded as the nation grew and the interrelations of water uses became evident until now legislation provides for developments for navigation, flood control, irrigation, hydro-electric power, major drainage, water supply, fish and wildlife conservation and improvement, pollution abatement, recreation and shore and beach protection.

In the next few minutes, I will attempt to illustrate how our own operations recognize the pollution problem, what police powers we exercise, over others, how our planning attempts to minimize pollution and how we seek to cooperate with others in reducing the problem.

Our dredging operations sometimes can and do create temporary pollution problems. Generally, the pollution is one of two types; it is either the result of the disturbance of offensive materials deposited on the river or lake bottom by others or pollution takes the form of turbidity. At times, pollution from both causes results from dredging operations. In the Detroit River, the offensive materials are both industrial and sanitary wastes.

Our most troublesome problem is in connection with disposal of the materials which contribute to the pollution problem. Until recently, materials removed from the Rouge River as part of our yearly maintenance program were dumped in the lower Detroit River or in Lake Erie. This procedure got rid of the material but it sometimes created a temporary pollution problem.

The United States Public Health Service in 1948 investigated the pollutional effect in the Detroit River of the maintenance dredging operations in the Rouge River. The conclusions from this study are as follows:

1. "The deposits in the Rouge River are highly polluted by sewage and industrial wastes, as measured by the oxygen demand and as shown by the high concentration of such constituents as iron, oils, sulfides, and volatile solids.

2. "The dumping of Rouge River dredged material in the Detroit River at the head of Fighting Island constitutes an extension of pollution to a relatively unpolluted area of the Detroit River.

3. "The primary responsibility for extension of the polluted area is not with the Corps of Engineers who, in accordance with Congressional instructions, are maintaining a facility of general benefit to the public and of specific benefit to the industries using the Rouge River for commercial traffic. The primary responsibility is with the municipalities and industries occupying the banks of the

Rouge River and discharging inadequately treated sewage and industrial wastes into the stream.

4. "The investigation did not demonstrate great degradation in the quality of water in and below the dumping area, nor did it demonstrate damage of great consequence to lower riparian users under conditions existing at the time of the study."

The recommendations, edited for brevity, are as follows:

In connection with operations during the near future, it is the recommendation of the Public Health Service that the Corps of Engineers continue dumping of Rouge River dredged material as has been practiced in the recent past.

It is not the intention of the Public Health Service to recommend indefinite continuation of dredging of the Rouge River on the present scale with dumping either at the head of Fighting Island, along the shore-polluted area opposite this point, or at a point in clean water below the Wyandotte intake.

The second recommendation of the Public Health Service, having to do with the long-term activities of the Corps of Engineers, is that a vigorous attempt be made by the Corps of Engineers to reduce the amount of Rouge River dredging, by action leading to reduction of discharge of settleable material by contributing municipalities and industries. In providing the legislation under Title 33, Section 407 of the U.S. Code on Navigation and Navigable Waters, it is believed that it was not the intent of the Congress that such dredging operations should provide a method of disposal of solid material deposited by individuals or corporations in navigable streams. It is desirable not only that dredged channels be maintained, but that every step possible be taken to keep the cost of such maintenance to a minimum. In the present instance, action, even to the extent of applying legal remedies, taken to reduce the discharge of solid material to the Rouge River, would not only reduce channel maintenance costs but would also aid in correcting a pollution problem of considerable magnitude.

It may be of interest to you to know that private funds are contributed to us for removal of a part of the River Rouge material. The amount contributed is based on the proportion of materials deposited in the river by any one company as determined by a laboratory sampling process. It is interesting to note that at least one company recently has proved that it has materially reduced the discharge of solid wastes in its processes and has been able to reduce its contribution to the cost of maintenance dredging.

It is obvious however that reimbursement for removal of illegal deposits is not the final answer for the Rouge or Detroit Rivers. For one thing, it would not stop the pollution which is actually out of our legal jurisdiction. For another, it is not feasible to secure satisfactory pecuniary settlements from all private companies and political subdivisions whose waste is no doubt causing much of the shoaling in the lower Detroit River. The large number of industrial and municipal sources, both United States and Canadian, together with the mechanical and technical cost problems involved in quantitative allocation rules out effective action in this area.

Our responsibilities relating to pollution of navigable waters are defined by law. Our interests do not stop here for we do recognize the need for pollution control and abatement in other activities under our jurisdiction such as dredging and flood control projects. I will discuss these items in more detail.

Section 407 of Title 33 United States Code (Section le of the River and Harbor Act of 1899, as amended) pertains to the deposit of refuse in navigable waters. In general, this section makes it unlawful to put refuse matter of any kind into any navigable water of the United States, either from the shore, or from a ship, barge, or other craft.

Occasionally we get letters from individuals reporting the depositing of refuse in navigable waters by pleasure boat operators. If we are able to get definite information on the violators, we write them a letter citing the applicable law and informing them that appropriate action will be taken in future violations. Although this is a minor problem at the present time, we feel that we must continue to take action in all known instances of violation to prevent the dumping of garbage from becoming a major problem.

Periodically we issue public notices to navigation interests, small boat interests, civic organizations, state and local agencies, Federal agencies, and interested private individuals concerning the matter of discharging oil into navigable waters. The "Notice to Mariners," a U.S. Coast Guard publication, is also utilized for this purpose. In this notice, we cite Section 13 of theRiver and Harbor Act of 1899 (33 USC 407) with its penalties together with a procedure for reporting violations. The U.S. Coast Guard has been very cooperative in reporting these and other violations.

When we issue permits authorizing the installation of outfall sewers that may conceivably affect the naviability of water courses due to the escape of solids, we insert the following special conditions:

1. This permit does not authorize the discharge of solids of any kind or description, suspended or otherwise.

2. That should any deposit in, or any obstruction to, the navigable capacity be found to be the result of, or attributable to, the discharge from the authorized sewer outfall, the permitee agrees, upon notice from the District Engineer, to promptly remove the material forming all such deposits or obstructions to the satisfaction of the District Engineer without expense to the United States.

The law pertains also to material deposited on the banks where it can be washed into the waters. The law does not apply to operations in connection with the improvement of navigable waters or construction of public works by the Federal Government. Materials may be deposited if proper permits have been obtained from the Corps of Engineers.

We have an informal agreement with the City of Detroit whereby we prohibit dumping of polluted materials in the St. Clair dumping grounds at the head of the Detroit River as a protective measure for their raw water intake near Belle Isle. If we suspect that the dredged material in the application for permit is polluted, we require laboratory tests be made of the material.

When we enter into a study for a new dredging project, we attempt to develop the plan which will produce the best results for the least cost. An item which can have quite an effect on the cost of a project is the type of dredging plant that will be used. Generally, if the character of the materials allows a choice, it will be cheaper to do the work by hydraulic dredge rather than by dipper dredge. However, nearby disposal is then required either on land or within a diked area. That is a problem we are presently concerned with on our Trenton Channel project, a channel improvement project now authorized for construction. A part of that channel can be dug by hydraulic means at a considerable savings. Our study of the advantages of going to hydraulic dredging in the upper reach of the Trenton Channel included investigation of the use of a shallow water disposal area in the area known as Mud Island. A diked disposal area has been considered. It was feared by some that disposal in this area would adversely affect the quality of the raw water taken in at the City of Wyandotte and the new Southwest Detroit intakes.

Studies of the existing flow pattern of the Detroit River indicates that filling on Mud Island would have no recognizable effect on the present flow regimen and would not produce a lower quality of raw water at the Southwest Detroit Plant intake. The Wyandotte intake would experience some increased turbidity during dredging operations. However, the effect could be greatly reduced by our not permitting dredging operations during the periods of maximum water use.

We have two studies underway concerning River Rouge which could have an effect on the water quality of the Detroit River. One of these is a flood control project extending upstream from the turning basin area to Michigan Avenue and the other is a channel improvement project extending upstream from the Detroit River to Jefferson Avenue. Every effort will be made to control turbidity and to minimize pollution by offensive materials, during the course of construction of these projects.

Recently, the Chief of Engineers issued a new directive pertaining to streamflow regulation for water quality control. This may have only a very minor effect on the Detroit River problem, but I believe it is worthy of some discussion at this time. Authority for consideration of this aspect of water resources development by the Corps of Engineers is contained in the Federal Water Pollution Control Act Amendments of 1961 (Public Law 87-88). Section 2 of the law states: "In the survey or planning of any reservoirs by the Corps of Engineers, Bureau of Reclamation, or other Federal agency, consideration shall be given to inclusion of storage for regulation of streamflow for the purpose of water quality control...". The law states further that the need and value of storage shall be determined with the advice and assistance of the Department of Health, Education, and Welfare.

There is no doubt that the need for and value of water quality control will increase in the future. It is our intention to consider storage for water quality control as a project purpose whenever we investigate the feasibility of a reservoir site.

We are currently working on a survey of the Huron River for flood control and other purposes. One of our primary efforts here will be on the problem of water quality control. Compared to the total pollution load carried by the Detroit River, that portion contributed by the Huron River probably is quite insignificant. However, by itself, it is important and is one of the major concerns of the communities in the Huron River basin. We have a working agreement with Region V of the Department of Health, Education, and Welfare for a study of the flow augmentation needs and water supply requirements of the area generally downstream of Ann Arbor.

Whenever we start a study for navigation, flood control, or any other water use, we notify Federal, State and local agencies and other interested parties of our intent. At the same time, we indicate the general nature of the problem and the probable solutions, if that is possible at the time. We also ask that each agency express its interest and indicate, if possible, the points at which there may be conflicts of interests and purposes. This is done because policy recognizes the value of this coordination and a complete and frank discussion at this point by all concerned would serve to point up the possible areas of conflict at an early date. When these conflicts of interests show up as surprises at a late date, they usually result in an increase in the cost of a study or a project.

Now, in very brief conclusion, I would like to point out again that:

Our dredging operations will always produce some turbidity and possibly some pollution. This is a temporary condition -- something that generally accompanies improvement of facilities to accommodate larger vessels to serve industry better. However, I feel that I can point with some pride to our efforts to control these side effects of our dredging operations to the very best of our ability, and to the extent possible consistent with the need to get the job done and at the least practicable cost. I feel, too, that our efforts with regard to streamflow regulation for water quality control will eventually contribute to the over-all effort to reduce pollution in all areas.

We do have some police powers pertaining to dumping materials in navigable waters which have some effect on pollution.

Our planning of jobs recognizes the pollution aspects of our work and attempts are made to minimize these effects.

Finally, we solicit comments on our proposed operations so as to resolve conflicts of interest at the earliest possible date in our planning.

Thank you very much.

THE CHAIRMAN: Thank you, Colonel. Mr. Poston.

MR. POSTON: Colonel Pfeil, relative to the location of sources of sediment on the bottom of the river which must be dredged by you, I suppose that the biggest share of this comes from liquid wastes of which there are visually, I notice, dumps on some of our streams. I wonder, do the Corps of Engineers give permission for the locations of these dumps along the stream banks?

One further question. In the location of these dumping grounds for emptying wastes and dredged materials the Public Health Service was reported as approving these. These are locations that are also sent to the state agencies that are interested, and comments are requested from the state agencies on the locations of these dumping grounds. Is that right?

COL. PFEIL: That is true. Yes, sir. All of our dredging plans are submitted to the Department of Conservation, the Waterways Commission, and the Water Resources Commission so far as the state agencies are concerned, and they get them as a matter of routine.

Your first question dealt with the nature of the materials that were dredged, and I think I must say that with the exception of the Rouge River dredging we do not make an analysis which would lead us to a conclusion as to the sources. Our analysis of bottom materials in the area to be dredged is directed simply to determine how that material can best and most economically be handled by the equipment put on it.

MR. POSTON: I think you answered the other part of my question which had to do with the fact that prior to commencing a specific contract of work for removing of bottom sediment or sludge from the river, or deepening of the channel, you do notify users downstream so that they have ample notification that they might anticipate turbidity or change in the quality?

COL. PFEIL: Well, we do, whenever we anticipate an adverse effect. I think I can cite a case of the dredging of Lake St. Clair in which we worked very closely with the City of Detroit in asking them to notify us when turbidity reached the point which could not be properly handled by their waterworks.

Similarly, in the work we are about to start in the Trenton channel, we dealt with the City of Wyandotte in order to assure ourselves that the turbidity we create will be at a minimum and it willnot be occurring at a time when the heaviest demand for water usage is in existence.

I can't say absolutely, Mr. Poston, that we never create turbidity, or that we create it and fail to notify somebody who has a need to know, but to the best of my ability we do notify all persons who would be adversely affected.

MR. POSTON: Thank you.

THE CHAIRMAN: Colonel Pfeil, I was interested in your comments on the Federal Water Pollution Control Act and the storage and discharge and releases of water for water quality control. However, the part that interests us, and I know interests you, and I think we should call it to the attention of the group here, is that the law says: "Such storage and water releases shall not be provided as a substitute for adequate treatment or other methods of controlling wastes at the source."

In other words, under this law don't expect to get dilution water as a substitute for treatment.

COL PFEIL: We will still try to give you dilution water even though it may not be a substitute.

THE CHAIRMAN: All right. Thank you, Colonel. Mr. Poston.

MR. POSTON: The Department of Justice is represented today by the United States Attorney for this area, Mr. Robert F. Ritzenhein, who has a statement.

STATEMENT OF ROBERT F. RITZENHEIN, ASSISTANT UNITED STATES ATTORNEY, REPRESENTING LAWRENCE GUBOW, UNITED STATES ATTORNEY FOR THE EASTERN DISTRICT OF MICHIGAN.

MR. RITZENHEIN: I am Bob Ritzenhein, Assistant United States Attorney for the Eastern District of Michigan.

Mr. Chairman and distinguished representatives of government, ladies and gentlemen:

I am happy to be here as a participant in this conference and as a representative of the United States Attorney's Office for the Eastern District of Michigan. Mr. Lawrence Gubow, the United States Attorney, has asked me to appear on behalf of this office and has asked me to express to all of you his interest in the work of this conference and to speak about the responsibility which the United States Attorney for this District has under the Federal Water Pollution Control Act.

As you know, during the past summer, July 20, 1961, the Congress enacted new legislation which will strengthen our hand in pollution control enforcement. It also provides individual cities more financial aid in building sewage treatment plants. This is a Federal program. It can work well only if our State, our local communities and our industries fulfill their responsibilities.

The policy of Congress as expressed by the 1961

Act clearly calls for the encouragement of State action. Enforcement by the United States Attorney would only be undertaken where Michigan failed to take the necessary remedial action.

The Congress provided in Section 466 g of Title 33, United States Code, that following our conference the Secretary of Health, Education, and Welfare shall prepare and foward to all the water pollution control agencies attending the conference a summary of conference discussions, as Mr. Stein pointed out. This would include:

a. Occurrence of pollution.

b. Adequacy of measure taken to abate pollution.

c. Nature of delays encountered in abating the pollution.

If effective progress is not being made and the health and welfare of any persons are being endangered, the Secretary shall recommend necessary remedial action, allowing at least six months for the taking of such recommended action.

If the Secretary finds that the action has not been taken, he shall call a public hearing before a Hearing Board of five or more persons. On the basis of the evidence presented at the hearing, findings and recommendations are to be made to the Secretary of Health, Education, and Welfare. The Secretary is required to send the findings and recommendations to the person or persons discharging any matter causing or contributing to the pollution together with a notice requiring the abatement of the pollution. The time to clear up the problem is to be not less than six months.

The U. S. Attorney could be brought into the case at this point. If the pollution is not stopped and health of people in another State is endangered, the Secretary could request the Attorney General to bring a suit on behalf of the United States against the persons contributing to the pollution. Undoubtedly, the action, if it were authorized by the Attorney General, would be brought in this District by the U. S. Attorney.

If the pollution endangered the health of Michigan citizens the written consent of the Governor of Michigan would be required before we would be authorized to sue to secure abatement of the pollution.

An important part of the legislation states that individuals, corporations, partnerships, cities, counties, or other public bodies could be the subject of such a suit.

It would be possible to imagine a situation in which the pollution of the Detroit River or its tributaries was not stopped in the time established by the Secretary of Health, Education, and Welfare. It is also possible to imagine a situation in which the pollution was not stopped following the findings and recommendations of the Hearing Board. Under those circumstances, then the U. S. Attorney's Office could be authorized to sue the polluters in the Federal District Court in Detroit.

If the polluter were a corporation, we would have a case of United States versus that corporation. If the polluter were a city which had failed to take the necessary action, it is possible for the Attorney General to authorize a suit by the United States against one of our cities, or in the case of a county, for example, against Wayne County.

These are distinct possibilities. We hope they never happen. But they do point out how serious pollution control is. They do give us some idea of the importance which the Congress and the Administration attach to the safeguarding of this vital natural resource.

The Federal Court does have jurisdiction under the Federal Water Pollution Control Act to enter a judgment and to enter orders enforcing the judgment. It is to be hoped that every attempt would be explored by our cities, State agencies, private industry, and all persons concerned with the necessity of preserving our States' water supply to work together to see that the problems of preventing pollution are solved far in advance of court action. Litigation is expensive and time-consuming. It could also be embarrassing to those municipal officials or corporations who failed to meet the challenges of our times.

We cannot stand by passively and watch pestilence and disease strike our exploding population when positive action now could conserve the purity of one of our State's greatest natural resources.

My remarks so far have been concerned with the United States Attorney's responsibility under the Federal Water Pollution Control Act. But I would also like to emphasize a point made by Colonel Pfeil, that another section of the Federal laws makes it a crime to throw any refuse matter of any kind into any navigable water of the United States, or into any tributary of any navigable water of the United States. This statute provides for criminal prosecution of violators. A fine up to $2,500 could be imposed, plus one (1) year in a Federal penitentiary.

The United States Attorney's Office stands ready at all times to uphold the laws of the United States and to see that violators are dealt with firmly. This goes for matters involving pollution of the Detroit River and its tributaries, too. Certainly, this is especially important in southeastern Michigan in view of the growth of the port of Detroit as an international seaport on the St. Lawrence Seaway. We are sure that it is also a vital concern to the health and welfare of the population in the downriver area, and in the western part of Wayne County.

The enforcement laws which I have reviewed briefly here today are tools to be used in dealing with an alarming problem. The United States Attorney will not shirk the responsibility if called upon to use those tools. The real solution, however, lies in cooperative and vigorous action now by local, State and Federal Governments to develop a program that will make these tools unnecessary. It is a job which can be done and which we in the United States Attorney's Office feel will be done. Responsible control and prevention now is the best hope for protecting our civilization against its own poisons.

Thank you.

(Applause.)

THE CHAIRMAN: Any questions? Thank you very much. Mr. Poston.

MR. POSTON: Mr. W. H. Nord, of the Bureau of Sport Fisheries and Wildlife will make a presentation for the Fish and Wildlife Service.

STATEMENT OF WARREN H. NORD, SUPERVISOR,
BRANCH OF RIVER BASIN STUDIES, BUREAU OF
SPORT FISHERIES AND WILDLIFE, DEPARTMENT OF
INTERIOR, 1006 WEST LAKE STREET, MINNEAPOLIS
8, MINNESOTA.

MR. NORD: Mr. Chairman, conferees, ladies and gentlemen: My name is Warren H. Nord, Supervisor of the Branch of River Basin STudies, for the Bureau of Sport Fisheries and Wildlife, Region III, Minneapolis, Minnesota.

The State of Michigan is particularly fortunate in having an abundance of coastline on the Great Lakes. This gives Michigan an advantage in water use for commerce, industry and recreation. It also places a tremendous responsibility upon the State to safeguard this trust and plan wisely for its use.

Water, along with air, soil, and sunshine, provides for the living needs of man. And man, in turn, is concerned with the quality of water serving his needs. One of these needs is for fish and wildlife habitat. Clean water provides this habitat; polluted water denies fish and aquatic wildlife a place to live.

The demand of civilization for water and the critical continuing need for suitable aquatic habitat for wildlife complicate the water problems of the Detroit River. We know these waters are used over and over again for all purposes, including the disposal of waste materials. The Bureau of Sport Fisheries and Wildlife believes they should be used by fish and waterfowl and used with safety by those animals; safety from poisonous chemicals in the water and safety from death due to lack of oxygen in the water.

On a national scale the growth of the economy and the population explosion will inevitably make more demands upon and make deeper inroads into the natural aquatic domain of fish, shellfish, and wildlife. At the same time, fishermen and hunters are demanding more and more production of fish and wildlife from the water and related land resources.

Concurrent with this demand is the ever-increasing volume of effluent emptied into our natural waterways which is harmful to the fish and wildlife resources. This is apparent in the Detroit River, whose banks are encroached upon by numerous industries, both large and small, housing developments, and expanding recreational activities. The river now carries large volumes of municipal sewage and industrial waste as well as commercial and sanitary wastes discharged from watercraft.

Water pollution has been defined as the downgrading of water quality attributable to physical and chemical changes resulting from the acts of man. Thus the introduction of foreign elements as well as major manipulations of water temperatures are included within the meaning of the term, water pollution.

Visible evidence of industrial and domestic pollution in the Detroit River consists of rings of oil scum on vegetation, bulkheads, and boat hulls; variations in the color and transparency of the water, especially along the shorelines, and by gaseous bubbles rising to the water surface in protected bays and slow-moving currents. When the external indications reflect gross pollution the fish and wildlife resources are seriously affected through direct toxic effects and through the reduction of dissolved oxygen necessary to sustain desirable aquatic animal life.

Loss of habitat from pollution and deposition of dredge spoil are among the most important factors harmful to wildlife resources of the Detroit River and Western Lake Erie. It is estimated that there are about 6,000 acres of shoal water on the American side between the Ambassador Bridge and the head of Lake Erie. These shoal areas support some of the most preferred natural waterfowl foods known to be consumed by canvasback, redhead, scaup, mallards, and black ducks.

The major plant associations consist of wild celery, coontail, water milfoil, various pondweeds, and waterweed. The celery beds constitute one of the few good winter feeding grounds for canvasbacks in the Great Lakes region. Associated with these plant beds are an abundance of snails and other crustaceans which are important animal foods for diving ducks.

These foods are available to waterfowl concentrations until January, at which time an ice shelf usually forms over all slow-moving water areas of the Detroit River. The river is generally icebound for comparatively short periods in January and February, although narrow strips of water usually remain open in the main channel. During these periods of extensive ice cover, waterfowl are forced to dive under the ice for the available shoal-water foods. Starvation occurs if this condition persists for an extended period of time. Losses from starvation are increased at times when the river is contaminated with oil or detergents. These substances tend to nullify the natural insulation and buoyancy of the feather coat, and without such insulation the birds become easy prey to the rigors of winter.

The national importance of the Detroit River transcends local waterfowl interests, as it is the staging area for migrations of canvasbacks, redheads, scaup, and black ducks using the Atlantic and Mississippi Flyways. As a canvasback feeding area, it is in a class with the famous marshes of Chesapeake Bay. In the Great Lakes Region it is considered among the few remaining areas providing habitat significant to waterfowl.

Biologists of our Bureau and the Michigan Conservation Department have conducted aerial surveys of waterfowl use of the Detroit River from Ambassador Bridge to Lake Erie. Such use during the winter, spring and fall seasons since 1950 is as follows: The figures I am going to give are minimums and maximums for the various period of years.

Winter--5,000 (1961-62) to 88,400 (1958-59)

Spring--14,000 (1949-50) to 70,000 (1954-1955)

In the fall we have it broken down by pre-waterfowl season and mid-waterfowl season and post-waterfowl season, and it reads as follows:

Pre-waterfowl season (fall) 4,400 (1952-53) to 12,200 (1949-50)

Mid-season (fall) 5,500 (1959-60) to 293,000 (1953-54)

Post-waterfowl season (fall) 25,500 (1954-55) to 95,000 (1952-53)

Canvasbacks have made up approximately 65 percent of the waterfowl using the area in the last few years.

There is little doubt that the river supports a resource of great aesthetic and sporting value for the thousands of people within and outside the Detroit Metropolitan Area. The national importance of waterfowl habitat in the Detroit River is emphasized by data from waterfowl banding operations. Throughout the last decade, waterfowl banded along the Detroit River have been recovered in 29 States, including Alaska and in 6 Canadian provinces.

The establishment of the Wyandotte National Wildlife Refuge by Public Law 87-119, dated August 3, 1961, is further evidence of the importance the Bureau of Sport Fisheries and

Wildlife places on shoal areas of the Detroit River and Western Lake Erie. This area constitutes a tremendously important link in the Bureau's continental refuge system, providing highly-prized beds of wild celery for canvasback and other "diving" ducks.

Pollutants discharged into the Detroit River have, on a number of occasions, caused considerable losses in the late fall among wintering waterfowl concentrations. Our Federal Game Management Agents have worked with Michigan Conservation Department personnel in investigating sources of pollution and determining the extent of wildlife mortality brought about by the pollutants. Some of the most notable instances are:

a. February 1948; cause - oil and pickling brine; 10,000 ducks lost, representing about one-fifth of wintering population.

b. October 1948; cause - oil at Pt. Mouillee; 1,000 ducks lost.

c. March 1950; cause - oil and starvation; 900 ducks lost.

d. February and March 1951; cause - oil scum; 250 ducks lost.

e. March and May 1952; cause - oil; about 1,000 ducks lost.

f. February 1955; cause - undetermined; about 2,600 ducks lost.

g. March 1960, cause - sewage diversion (glycerin and detergents) Detroit; 10,000 to 12,000 ducks lost, representing about 50 percent of the concentration.

h. November 1960; cause - cutting oil (1,500 gallons); 71 ducks lost.

i. January 1962; cause - oil; no ducks killed. At least, none that came to our attention.

Industrial expansion of the Detroit area in the last decade has had considerable influence upon the wintering duck concentrations. It is natural for ducks to remain in the vicinity of available and accessible food until forced to move either by reduction or elimination of food or by freezeup.

In the Detroit River area warm-water discharges from industrial plants have resulted in open water throughout most of the winter in some areas. In recent years the combination of open water and an abundance of available food has encouraged larger waterfowl concentrations to remain in the Detroit River during the winter months. This combination has unwittingly created a hazard for waterfowl, especially when extended [illegible] periods cause ice to form over the shoal areas or when [illegible] or detergents interfere with the normal functions of the birds.

On occasion our Bureau and the State have had to resort to artificial feeding as a remedial measure to attract ducks away from polluted waters and iced-over shallows. However, this is only a stopgap measure to overcome an emergency situation which exists.

The sport fishery of the Detroit River and Western Lake Erie is also affected by habitat changes due to pollution. Especially noticeable in the lower Rouge River and its confluence with the Detroit River as well as at the mouths of the Detroit River and the Maumee River is the bottom deposit of sewage sludges. The normal bottom fauna of insect larvae and other invertebrates has been replaced by concentrations of tubificid worms. According to Mr. Charles C. Davis, Department of Biology, Western Reserve University (The Biatic Community in the Great Lakes with Respect to Pollution. Paper presented by Mr. Davis at Pollution Conference, De Paul University, Chicago, Illinois, May 15 and 16, 1961.) such bottoms are unsuitable for fish breeding and unsuitable for bottom feeding by many fish species.

Our sister Federal Bureau, the Bureau of Commercial Fisheries, in reporting on Lake Erie, states that the once abundant cisco, whitefish, and blue pike that prefer clean water, have all but disappeared. The lake is no longer ideal habitat for the walleye and yellow perch. The less desired, yet more tolerant species, such as white bass, sheepshead, smelt, and carp are more abundant.

Since industries and municipalities are responsible for discharging pollutants into the Detroit River and since the acreage of open water during the winter is not likely to decrease, and since the winter waterfowl concentrations more than likely will continue to use this open water and the existing available food, the responsible parties have a moral obligation to resolve the pollution problem in the Detroit River. Similarly, all Federal and State agencies having an interest in clean water also have the responsibility of publicizing violations and enforcing pollution laws.

The Department of the Interior is a signatory to a Memorandum of Understanding with the Department of Health, Education, and Welfare, dated July 24, 1958, concerning control of water pollution. In accordance with the Fish and Wildlife Act of 1956, this Memorandum of Understanding provides for the mutual cooperation of the two Departments in the control of pollution as it may affect fish and aquatic life. The Fish and Wildlife Service also has certain authorities under Section 5 of the Fish and Wildlife Coordination Act dated August 12, 1958 (48 Stat. 401, 16 U.S.C. 661 et seq.).

One of our greatest needs today is to create a public awareness of the seriousness of water pollution. This appears to be mandatory before corrective measures recommended by government agencies can receive the backing and approval of the American public.

Can we enforce the following measures without wholehearted public approval?

a. Provide and equip small watercraft with acceptable treatment devices for domestic sewage:

b. Restrict dumping of domestic and commercial wastes from large, lake-type and ocean-going vessels?

c. Expand and modify waste treatment facilities to meet changing water-use needs, to reduce overloading and to eliminate obsolete equipment and methods?

d. Develop new methods for reprocessing industrial wastes to eliminate offensive tastes, odor, color, toxins, and pathogenic elements?

e. Develop a public conscience in maintaining health standards at swimming beaches, scenic beaches, and marina developments, and to abstain from disposal of garbage and waste in our waterways?

f. Develop safety devices in conjunction with industrial and municipal facilities for the prevention of so-called accidental pollutant discharges?

g. Demand a cooperative and coordinated effort among Federal and State agencies and industry in solving and eliminating problems concerning toxic and non-toxic spoil, industrial solid sediment waste and radioactive wastes?

The future of fish and wildlife and recreation associated with the Detroit River depends upon the progress made in providing a fuller knowledge of the various factors affecting the fish and wildlife habitat and resources and in implementing corrective measures for the control of industrial and municipal wastes entering the river.

If the Detroit River and Lake Erie are to continue to contribute to the welfare of fish and wildlife, especially waterfowl as a resource of international importance, pollution of these areas must be reduced and kept within tolerable limits.

A clean Detroit River can provide good outdoor recreation for city dwellers almost at their doorstep. For those who, for various reasons, cannot travel to the upstate recreational waters, the Detroit River means recreationclose to home.

A clean Detroit River can provide a suitable living place for fish and wildlife to enrich the lives of all who utilize and enjoy them.

A clean Detroit River can be an invaluable asset and a great source of pride to the mighty industries and the millions of residents living along its shores or working in some of our country's great factories.

A clean Detroit River can be a prescription to better health and recognition of the compatability of heavy industry with clean waters.

Thank you.

(Applause.)

THE CHAIRMAN: Any comments or questions? Thank you very much. Mr. Poston.

MR. POSTON: The Bureau of Commercial Fisheries of the Fish and Wildlife Service is represented by Mr. W. F. Carbine. Mr. Carbine.

STATEMENT OF W. F. CARBINE, REGIONAL
DIRECTOR, GREAT LAKES-CENTRAL REGION,
BUREAU OF COMMERCIAL FISHERIES, U. S.
DEPARTMENT OF THE INTERIOR.

MR. CARBINE: Mr. Chairman, conferees, and ladies and gentlemen: It is a pleasure to be here to explain the responsibilities and interests of the Bureau of Commercial Fisheries in the prevention and control of pollution. I am W. F. Carbine, Regional Director of the Bureau of Commercial Fisheries, U. S. Department of the Interior, with headquarters in Ann Arbor, Michigan.

The Fish and Wildlife Act of 1956 (70 Stat. 1119, Public Law 1024, 84th Congress), and a wide variety of statutes enacted over the years, authorize a broad range of activity by the Bureau of Commercial Fisheries. The national fish policy established by the 1956 Act places high on the list of goals the responsibility for the economic betterment of the commercial fishing industry in all its phases -- production, processing and distribution. This responsibility extends to the control and prevention of pollution. Pollution is probably the primary factor today that limits the production of fish in fresh and estuarine waters and, in fact, threatens future fish production.

Pollution has many definitions, depending on the interests of the individual. If water for human consumption is the main interest, then with adequate treatment, perhaps the waters of the Detroit River and western Lake Erie are of good quality. It is of interest to note, however, that some water intakes have been abandoned and others have been extended out into the lakes because of water quality problems. A measure of pollution is the suitability of water for a required use. Consequently, pollution can be defined as the addition of any substance or any action or condition which interferes with, lessens, or destroys a beneficial use of a water. The Bureau of Commercial Fisheries is presently concerned with the suitability of the waters of the Detroit River and western Lake Erie for fish and fish food organisms. However, it is difficult to localize the areas that are affected severely by a pollutant.

Very often the effects of effluents are expressed as maximum biological demonstrations miles from the origin. This situation is demonstrated by present conditions in the central basin of Lake Erie where approximately 1,400 square miles of the bottom waters are almost devoid of dissolved oxygen during part of the year. A total of 3,000 square miles of the bottom waters are dangerously low in dissolved oxygen. We must, therefore, include much of western and mid-Lake Erie in measuring the effects of contributions of pollutants made to the lower Detroit River.

The Great Lakes and their connecting waters comprise the largest single expanse of fresh water in the world and are rightfully included among our Nation's major natural resources. These immense lakes have been frequently referred to as inland seas. Perhaps this analogy has been carried too far, however, and we have been led to believe that like the oceans, the lakes are little affected by the activities of man. Some of the earlier limnological surveys of the lakes did indeed suggest that, despite pollution of many of the tributaries and shore waters, the open waters of the lakes were remarkably free from chemical and sewage pollution. Data from more recent studies, on the other hand, show that the open waters are being affected by pollution.

The Detroit River and Lake Erie are changing rapidly and the progressive changes are threatening their value to the public for many uses. The aging process of a lake is usually so slow and subtle that it frequently goes unnoticed in the lifetime of a man. When lakes are used for the disposal of industrial and human wastes, the aging process may be greatly accelerated as has been thoroughly documented in Lake Zurich in Switzerland and Lake Washington near Seattle. Never before, however, has such a dramatic process of premature aging been detected in a lake the size of Lake Erie with its 10,000 square miles of surface area.

The commercial fishery of the Detroit River and the Michigan waters of Lake Erie are not particularly vital to the total economy of the region. The present commercial catch and total employment in the fishery is only a small percentage of that for the Great Lakes. The commercial fishery, nevertheless has contributed materially and steadily to the total benefits derived from the Great Lakes. Their worth could be increased materially. When fully developed, and with pollution under control, these waters could be expected to produce several million pounds of fish annually, having a retail value of about a million dollars. This choice animal protein is going to be needed in a few short years to feed our expanding population.

The recreational use of the Detroit River and western Lake Erie has shown phenomenal growth. The sport fishery is of vast economic importance to Michigan and the United States. The hundreds of thousands of anglers spend millions of hours catching as many, if not more, fish than the commercial fishery. Large industries in Michigan and the United States, such as manufacturers of fishing gear, boats and motors, are supported by these anglers. Many of these industries are located in Michigan.

Our aquatic resources are far more valuable than is indicated by the number of persons they support, or the dollar value of their products.

1. They are living, renewable resources which can continue to make their contribution to our welfare forever if we treat them wisely.

2. They enrich our diet with variety.

3. They promote our health, providing dietary supplements such as vitamins, trace minerals, and the essential requirements in wider variety than any other class of foods.

4. They further physical and mental well-being by providing outdoor recreation.

5. They have, because of the unique properties of their proteins and oils, potential uses as pharmaceuticals and industrial chemicals.

6. They supply to our animal industries vital proteins, fats and growth factors.

The Fish and Wildlife Act of 1956 recognizes that fish and shellfish are capable of making a great and continuous contribution to the national economy, food supply and health, recreations, and well-being of our citizens. When these resources are properly protected, properly developed, properly managed, and properly utilized, the Act considers them capable of being greatly increased. Control of pollution is one conservation measure that must be practiced. The alternative is destruction by neglect.

It is the National Fish Policy to:

1. Increase and maintain forever, for the people of

the United States, a fishery resource capable of yielding the maximum annual product.

2. Strengthen and maintain a vigorous fishery industry by assuring full and fair access to the American market.

3. Do these things in partnership with the States and in full accordance with our international obligations, and without sacrificing the system of free enterprise.

In pursuing these policies the Federal Government has a responsibility to the public as a whole to see that our fishery resources are utilized to the fullest economic extent without damage to their future productivity.

A deeper look into the complex problems facing our fishing industry today is a look into the major trends operating over decades that have produced the critical problems now facing us.

Our population growth, the change from rural to urban economy, and industrial development have caused increasing complications: First, from domestic wastes, then from dams, industrial wastes, channel and harbor improvements, marsh drainage and conversion of marshlands and backwaters to residential and industrial sites; more recently from the widespread and rapidly expanding use of insecticides, herbicides, detergents, and a host of other technological developments; and now the possible dangers introduced by disposal of radioactive wastes from research and industry.

Our raw material, the fishes, and the organisms upon which they depend for food, constitute the living resource in rivers, lakes and the sea. The fish are the property of no man until caught. In life they are the concern of the people and can be conserved and managed by governmental authority -- local, State, Federal or international. Because they are hidden beneath the surface of the water, special and complicated techniques are needed to find out how they can be managed so as to yield maximum sustained production. Sound management requires an understanding of the nature of living resources and the environment they inhabit. The stocks of fish which support our fisheries are self-renewing. They do not exist in limited quantities, like our mineral resources, to be used once and thereafter be gone forever. Living resources can endure forever, and therefore are more valuable, by far, than the annual yield would suggest. This is true only if we manage them wisely, and we can do this only if we understand the habits of the aquatic animals and plants and their inter-relationships with each other and with their surroundings.

Where the environment becomes changed or damaged by pollution, the fish population and fish food organisms have to adjust themselves to altered conditions or vanish. This produces fluctuations of abundance, changes in species composition, changes in growth rate and many other modifications, most of which do not benefit mankind. This has happened in the Detroit River and western Lake Erie where the environment has been injured or rendered unfit by pollution.

Recent studies have shown that the Detroit River and Lake Erie are becoming unsuitable for uses that once were traditional. An ever increasing load of wastes has resulted in vast changes in the physical, chemical, and biological characteristics of the lake. These changes, once noticeable only in the bays and shore areas, have spread throughout the lake, and now are a matter of grave concern to all who have an interest in, or who depend on, this freshwater resource.

The severity of the pollution problems that confrontus in the Great Lakes can be illustrated by conditions in Lake Erie. Conditions in the Michigan waters of Lake Erie and at the Detroit River mouth are shown by our studies of bottom fauna. During the past year we resampled most of the stations established in 1930 during a cooperative limnological survey of western Lake Erie. Abundance of tubificid (sludgeworms) as indicated by this survey was used for defining zones of pollution. One hundred to 1,000 sludgeworms per square meter were taken as indicative of light pollution, 1,000 to 5,000 as moderate pollution, and over 5,000 as heavy pollution. On this basis less than 10 percent of the Michigan waters of the lake in 1930 were moderately polluted, and heavy pollution was found only off the mouth of the River Raisin. Using these same criteria, we find that today about 80 percent of the Michigan waters are at least moderately polluted and approximately half of this area would be classified as heavily polluted. Comparison of data from 1961 with these from 1930 show some very dramatic changes.

Year	Sludgeworms/square meter	Mayflies/square meter
1930	0	40
1961	3,555	0
1930	1,500	0
1961	22,595	0
1930	162	101
1961	13,351	0
1930	0	176
1961	2,034	0

We have many stations upon which we can base similar figures. This map is not too legible, I am sure, for those in the back of the room, but this is the line that defines the Michigan water of Lake Erie. In 1930 this area in here was classified as lightly polluted, and this area in the River Raisin was heavily polluted, with this area lightly polluted. In 1961 it shows that almost half of the Michigan waters are heavily polluted, and almost all of the rest of the water is lightly polluted.

Our 1961 survey of the chemical characteristics of the lower Detroit River showed, as have several surveys in past years by other agencies, that somewhat better quality water is found in the shipping channel, but higher concentrations of most chemicals occur along the Canadian and American shores. Chloride concentrations were around 27 to 30 ppm in the channel and reached a maximum of 65 ppm near the American shore. The distribution of sodium, calcium and sulfates, and several other chemicals, was similar to that of chlorides. High chloride content waters extended south to Pointe Mouillee.

Over 2.6 million tons of silt are carried annually into Lake Erie. Untreated and inadequately treated sewage is polluting the tributaries and marginal waters of the lake Inorganic industrial wastes, including toxic substances, have been reported in many analyses of tributary streams and lake waters. Pollution of the shore waters recently resulted in the closing of the bathing beach at Sterling State Park near Monroe, Michigan.

Unfortunately, the fish is a victim of his surroundings. When conditions change over large areas, he has no chance to save himself. He is trapped and dies.

Areas of the Great Lakes most influenced by the increases in population and industry have shown marked changes in fish stocks. The confined areas of southern Green Bay on Lake Michigan and Saginaw Bay on Lake Huron have long received the wastes of growing populations and expanding industry. The superficial changes in water quality of these areas provoked pollution surveys that brought about improvement in water quality for domestic use. The continued entry of highly nutrient wastes created an over-enriched environment, however. As this occurred there was an accompanying gradual, almost unnoticed, retreat of highly prized species such as lake trout, whitefish, lake herring, and walleye, from the affected areas. These fish were replaced by increasing populations of carp, smelt, alewives, and stunted yellow perch.

The most dramatic changes in the fish populations of the Great Lakes have occurred in the densely populated and industrialized areas of the Detroit River and Lake Erie. The lake trout, whitefish, and cisco were once abundant in the Detroit River and supported one of the earliest major fisheries of the Great Lakes. These species disappeared from the river about the turn of the century and during the following years continued to retreat as unfavorable conditions spread from the shallower and more densely populated eastern end. Today Lake Erie produces insignificant quantities of cisco, whitefish, blue pike and saugers, once mainstays of the fishery, and the highly prized walleye is declining rapidly. How drastic these declines have been can be seen clearly from the comparisons of the earlier normal output with the take in 1960. This was obtained from the National Board of Inquiry Report.

	Normal Production	Production in 1960
Cisco	25,769,000	12,000
Whitefish	3,133,000	15,000
Blue pike	12,220,000	8,000
Sauger	4,386,000	2,000

The walleye yielded more than 6,000,000 pounds as recently as 1956, but in 1960 the take had declined to barely more than 1,000,000 pounds -- a drop of more than 80 percent. As the above species have been declining more resistant varieties or species whose spawning habits keep their eggs and young outside polluted areas have increased. Among them we may list the sheepshead, perch, carp, alewife, shad, smelt and goldfish.

Much of the adverse effects of pollution on these species that have all but disappeared can be traced to the severe oxygen depletion in central Lake Erie since the mid 1950's. Thousands of square miles of bottom are uninhabitable for fish, as I mentioned before, in mid and late summer and even when oxygen conditions permit fish to enter these areas they find a vastly changed food supply. The once dominant mayfly has all but disappeared, replaced by pollution-tolerant aquatic worms and midge larvae. Just how these conditions have affected each species we are not in a position to detail, but clearly, the influences have been catastrophic.

The present adverse state of affairs in Lake Erie represents only a stage in a process that has been underway for many years, and which now seems certain to advance at an accelerated rate as human population and industrial activities expand.

Indeed, the status of the Detroit River and western Lake Erie as a useful freshwater resource has become uncertain. An immediate stringent and effective control of pollution offers our only avenue of escape.

I thank you.

(Applause.)

THE CHAIRMAN: Thank you, Mr. Carbine. Are there any comments or questions? If not, thank you very much.

We are going to try to push on without a break. I understand that we have just four more people to go, and if anyone should have to leave before then I would like to announce that we are going to reconvene tomorrow morning promptly at 9 a.m. Mr. Poston.

MR. POSTON: The United States Coast Guard is represented today by Commander F. M. Fisher, Jr. Commander Fisher.

STATEMENT OF COMMANDER F. M. FISHER, JR., UNITED STATES COAST GUARD

CMDR. FISHER: Mr. Chairman, conferees, and ladies and gentlemen.

This is my first pollution conference and at this point I must say that we do very little in the field of pollution. In fact, I can almost say it in one sentence. We assist the Corps of Engineers in the enforcement of the Refuse Act. To give you a little more detail we help them mainly in cases of oil pollution by commercial vessels. United States Coast Guard officers and petty officers have the authority to board any vessel in United States waters and ask any questions we desire, and look at any documents and take any samples that have some connection with the Federal laws.

So, in some cases where we have pretty good information we will board a commercial vessel and take oil samples, and interrogate the crew, and take an oil sample from the water. This information is turned over to the Corps of Engineers for appropriate action. I might say that a lot of times we have cooperation from private citizens reporting oil slicks. We had one in the Straits of Mackinac last summer. Unless someone actually observes a ship discharging oil, or let us know within a few minutes after the ship goes through, we have a hard time tracing the source. We do not have a record of every ship that goes through the Straits of Mackinac, or the Detroit River, so we have a hard time checking back and finding out which ships went by. Without evidence from the ship,t he case would not be good enough to go to the United States Attorney

And we do have one other interest. I haven't told you my name yet. I am Commander Fisher from the Ninth Coast Guard District. I am Chief of Law Enforcement on the Great Lakes. I have a collateral duty as a cabinet officer between the City of Detroit and Cleveland, Ohio. Under the Magnuson Act, Coast Guard officers are responsible for the security of various ports. Detroit is probably the second or third largest port on the Great Lakes. We are interested in anything which would burn up the waterfront facilities or cause a ship to catch on fire, such as gasoline on the River Rouge. When that happens we do have authority to close off the river and to restrict or control movement of vessels through this area until it is safe.

I realize you are not too worried about gasoline because it evaporates and no longer produces a pollution problem. Oil also produces a fire hazard because it coats wooden wharves, or docks, or piers, and should a fire occur on the waterfront facility it would be much more difficult to extinguish.

I do want to mention that the Coast Guard has no responsibility for putting out fires on waterfronts. We assist where we can but it is a local responsibility.

That is about all I have to say. I have the record so far for the shortest speech of the day.

(Applause.)

THE CHAIRMAN: Thank you. I know, Commander, you do not regard fire hazards from oil as a responsibility of the Coast Guard. That is correct. But we do regard that as a fact of pollution.

CMDR. FISHER: Yes. I just told you our direct interest in oil in addition to the Refuse Act.

THE CHAIRMAN: Are there any questions? If not, we thank you. Mr. Poston.

MR. POSTON: The United States Geological Survey represented by Mr. Frank Clarke will make a statement. Mr. Clarke.

STATEMENT OF FRANK E. CLARKE, WATER
RESOURCES DIVISION, UNITED STATES
GEOLOGICAL SURVEY

MR. CLARKE: Mr. Stein and Mr. Poston, I was afraid you were not going to get around to me and I have another obligation to fulfill or I won't get around to go on another trip.

As I listened to these fellows talk I thought it was pretty sad to be a duck, or perhaps a fish in this neck of the woods, but when the Attorney General got through talking I thought it was better to be a duck than a person caught polluting the Detroit River. I sincerely hope since I have been a visitor here I have not been caught polluting this thing and there won't be a notice waiting for me when I get back home.

Complex as this pollution problem is, it is not just a question of collecting data but doing something about it. Although as a visitor I would like to say that I was greatly impressed by the amount of data that has been accumulated. I am sure we are all interested in doing something about this problem. I am here representing the United States Geological Survey and, incidentally, I am a research engineer for the Water Resources Division which is charged with the responsibility of studying water as a natural resource. In other words, we are interested in water for water's sake. Consequently we are interested in all aspects of it -- its occurrence, its movement and its quality. I would say quality is particularly important because we realize that a resource is ultimately judged on the basis of its quality. This of course points up the emphasis that we have been hearihg here today.

Our program is divided into two major parts -- a basic data collection program and a program that can be best described as fundamental research. The basic data collection program constitutes some 7,000 network stations and from this comes the feeling of the pollution of a natural resource. The influences of evolutionary changes and the influences of man -- we lump them altogether and try to determine how the water resource has responded to -- not just what it receives, but how it has responded to what it receives. This I think characterizes the aspect of our network stations. The data collected in these 7,000 stations are readily available to everybody concerned with control activity -- all of the agencies -- and the agencies use it.

For example, the State of Ohio, in their Department of Natural Resources, made considerable use of the United States Geological Survey data in a 1953 study of pollution in Lake Erie with a report entitled "Lake Erie Pollution Survey." You can read the sort of data developed.

Likewise there was a cooperative venture here on the Detroit River and the two lakes that was handled by the Corps of Engineers and the United States Geological Survey and various state and local groups, and this also used a considerable amount of our network data. It is the sort of contribution we make to the people who are interested in, and who have the control authority on pollution and other water quality aspects.

Our fundamental research programs are aimed at the determining of the natural laws that control water quality and control the resource. These would be concerned with the effect of the atmosphere on the water resource and the effect of soils on infiltering water; the effect of biota on the maintenance of sediment loads in the stream channels and on the flows that would result from any changes in these things.

Obviously these sort of data are also useful to people working in the field of pollution and who have the authority and responsibility for controls. I can point this up with a couple of examples real quickly, I think.

Our studies of thermal pollution is one. The United States Geological Survey has done a lot of work on what we call thermal loading of lakes and reservoirs, and from this have come some fundamental calculations by which a person can determine for a given lake what is likely to happen there, if you heat load it. We are doing a similar job on surface streams and are calculating and devising formulas, and devising equations, and expressions of natura laws which will tell a person what happens if he injects heat at a certain point, and what happens at a number of points; how it will die away and how it will diffuse, and what effect it will have on downstream users. Of course, it is closely associated with many pollution aspects.

Sediment studies likewise in our research program provide the same sort of information. They tell us for one thing what effect weather has on the sediment load; what happens to the clay as it makes its transit downstream and why one clay will absorb faster than another and where it is apt to accumulate in a channel, and what it is likely to add to the load on theCorps of Engineers who have to come along and scoop it out and put it on the bank.

So I would say all of these research programs are well laid down to determine the quality aspects which eventually get down into the specific area of water pollution.

I think all of you here today are quite aware of the importance of water quality. Our own programs are oriented programs in both network stations and research activities. They are well directed toward providing the knowledge which will be useful to the people who have control responsibilities. It has been a pleasure to be with you.

(The prepared statement of Mr. Clarke is as follows:

The U. S. Geological Survey is held responsible for the study of water as a natural resource, and thus is vitally interested in all aspects of its occurrence, movement, and quality. Quality is particularly important because it affects water movement and ultimately determines the suitability of available supplies for specific need. The Survey's research projects and basic data collection programs in national network stations cover characteristics resulting from man's influence, as well as those derived from natural sources. The information thus acquired is useful to many agencies that have the responsibility of correcting pollution problems.

The Survey's study of water resources is aimed at explaining the geophysical, geochemical, and biochemical processes which control the hydrologic cycle as a whole. It covers effects of atmospheric components on water quality; effect of earth materials on infiltering water, either precipitation or artificial recharge, dispersion and persistence of contaminants in water bodies; influence of terrestrial and aquatic biota on quality and movement of waters; temperature patterns and effects in water bodies; and significance of weathering, denudation, and sediment transport on water resources. All of these areas are related to pollution problems. Many of them involve subjects of major current interest in pollution control. Typical examples are described briefly below to illustrate the approach.

Thermal Loading Studies -- The Survey has made extensive heat budget studies on lakes and reservoirs and currently is developing mathematical equations for expressing temperature diffusion and die-away patterns in surface streams. With this information, it will be possible to calculate effects of overlapping heat sources in industrial complexes of various environments and to predict direct and indirect "thermal pollution" effects likely to result from new heat sources or water diversion projects.

Minor Element Research -- Considerable effort has been devoted to this subject through cooperation in the world-wide study of dissolved-solids and in a study of minor element characteristics of large rivers in the United States (USGS Circular 445). The program is being explanded to include a comprehensive study of contributions to the minor element cycle by aerosols, earth materials, terrestrial and aquatic biota, and bottom sediments. The influence of minor element nutrients and catalysts on life processes of aquatic plants and therewith on streamflow, natural waste disposal processes and sediment patterns will be covered. There is increasing evidence that "micronutrients" play important roles in photosynthetic recovery of polluted streams.

Sediment Studies -- This program is quite extensive. It includes daily samplings of sediment loads at numerous network stations and special basin areas; basic studies of geochemical changes in clay materials during stream transport; development of mathematical expressions for sediment distribution; studies of effects of urbanization and denudation on sediment loading and related surface water hydrology. Knowledge of sediment characteristics is especially useful in pollution control because of the many effects of suspended matter on water quality.

Research on fundamental hydrologic principles yields findings applicable well beyond the area in which the data are collected. Much of it therefore will be helpful in connection with any future studies of pollution in Michigan waters. Basic data collection programs are more specific to geographic area. The Survey cooperated with the State of Ohio in collecting streamflow and water quality data for an assessment of pollution in Lake Erie (see "Lake Erie Pollution Survey," State of Ohio Department of Natural Resources, April 1953). Extensive runoff and streamflow studies on tributaries of Lake Erie, Lake Huron and connecting waterways were also made in cooperation with the Corps of Engineers and various units of state and local government (see Southeastern Michigan Rain and Streamgage Committee's Annual Report, 1961).

There is little doubt that quality will be an important limitation in adapting existing water resources to the needs of an expanding population. The Geological Survey will cooperate in developing the knowledge required for maintaining acceptable quality in the nation's water supplies.)

THE CHAIRMAN: Thank you.

(Applause)

THE CHAIRMAN: Mr. Poston.

MR. POSTON: The United States Department of Agriculture is represented by Mr. Carl Miller. Mr. Miller.

STATEMENT OF CARL R. MILLER, DIRECTOR,
UNITED STATES DEPARTMENT OF AGRICULTURE
SEDIMENTATION LABORATORY, SOUTHERN BRANCH,
SOIL AND WATER CONSERVATION RESEARCH SERVICE,
AGRICULTURAL RESEARCH SERVICE, UNITED STATES
DEPARTMENT OF AGRICULTURE, OXFORD, MISS.

MR. MILLER: Like Mr. Clarke, I was also going to make a remark in opening by saying, "You fellow polluters but I think after the Department of Justice statement I will also refrain.

Mr. Chairman and conferees, and ladies and gentlemen.

First I would like to express the appreciation of the Department of Agriculture, and particularly the Agricultural Research Service for the invitation to participate in this conference. This is my first trip to Detroit in some ten years. I might say informally I am Carl Miller,Director of the United States Department of Agriculture Sedimentation Laboratory which is located at Oxford, Mississippi.

Although the conference is specifically concerned with the matter of pollution of the navigable waters of the Detroit River and Lake Erie and navigable tributaries thereto within the State of Michigan, with your permission I wish to direct my statement toward the over-all problem of sedimentation or "siltation" -- Mr. Clarke just touched on that briefly -- as a pollutant of streams, estuaries, and harbors, and the United States Department of Agriculture s interest and concern in these problems. The "siltation" problems are common, though varying in degree, to all sections of the country, including the Lake Erie area.

In its broad context the term pollution encompasses all manner of materials injected into, transported by, and deposited in the natural and constructed drainage systems of watersheds, and their appurtenant works, and thereby make the waters unclean, impure, dirty, or unavailable. Commonly, when speaking of water being polluted, one thinks of the chemical quality or sewerage contamination. However, another significant pollutant is sedimentation. Sedimentation includes all aspects involved in the detachment, entrainment, transportation, deposition, and consolidation of soil particles. In referring to sedimentation as it is associated with stream pollution, the common connotation is "silt" or "siltation".

The significance or degree of importance of the "silt" factor in over-all pollution problems, of course, varies from stream to stream. However, it is present, in the majority of streams in the country, in concentrations that are in excess of those desirable or allowable for full-value use of water. Dr. Abel Wolman, in a special report to the Potomac River Commission in 1957, stated "to the people living in the Washington, D. C., metropolitan area, 'silt' is the worst pollutant of the Potomac River."

The pollution caused by introduction of chemical wastes or untreated sewerage into a stream is subject to reasonably accurate analysis and correction. The primary problem in correcting or controlling the conditions is the justification of expenditures. However, the analysis and correction or control of "silt" pollution is not readily accomplished and it is likewise a difficult problem in terms of the economics involved.

The effects of sedimentation as it is pertinent to the over-all pollution problem, include:

(1) High costs of municipal water treatment to reduce sediment concentrations to acceptable levels. Acceptable levels vary from 5 to 200 parts per million but generally concentrations above 30 parts per million are considered intolerable. Most streams carry concentrations much in excess of these limits with averages ranging from

300 to 5000 parts per million but many in excess of 10,000 parts per million. Where municipal water is taken directly from a turbid stream the costs for silt removal often are much in excess of the costs that would be involved if chemical treatment only was required.

(2) Interference with water intakes and other stream associated installations. Sand or gravel bar development, lowering of water surface elevations by stream bed scour, or change in channel alignment because of accretions, result in costly control measures.

There are many examples of this interference. To cite one, the municipal water supply intake at Yuma, Arizona, has been interrupted in recent years by the development of sand bars on the Colorado River and the costs for removing sand from the waters are high. This is happening even though the over-all sediment concentration carried by the river water has been reduced many-fold by construction of dams upstream.

(3) Deterioration of recreational and aesthetic values. Placing a dollar value on the detrimental effects of sedimentation on swimming, fishing, boating, hunting, park development, shore front home lots, and related water oriented recreation is difficult. However, the effect of sedimentation on the recreational aspects of waterways and lakes is readily evident to most of us.

(4) Reduction in usable capacity of water impoundments. Dams constructed to store water also store the sediments transported by the water. Sediment encroachment on water storage capacity in single and multi-purpose reservoirs is a major problem in some areas of the country. The number of incidences of reservoir storage replacement to restore needed capacities is steadily increasing.

(5) Interference with estuary and harbor operations and enterprises. To cite but two examples: (a) The costs for "silt" dredging in the Potomac River estuary in the vicinity of Washington, D. C., are projected at $1,500,000 per year; and (b) since 1946 construction activities by the U. S. Department of Agriculture, Soil Conservation Service, have been in progress in the Buffalo Creek Watershed authorized in the Flood Control Act of 1944 as amended. Approximately $3,700,000 have been expended for channel improvement works primarily to reduce sedimentation in the Buffalo Harbor at the eastern end of Lake Erie.

General A. C. Welling, speaking at a special silt pollution meeting in Washington, D. C., a few years ago, concluded his remarks on pollution costs associated with water treatment, cleaning sediment from storm sewers, channel maintenance, and intangibles with regard to recreation, fish and wildlife, and health of the Potomac River, with the following statement:

"If only these costs, and they are by no means all-inclusive, are capitalized at 4% per annum, a capital expenditure of over 44 million dollars could be justified for remedial works. When money of this magnitude is involved, the time has come when we should take a persistent, searching look at the sources of our problem and marshall forces of the region to solve them."

The sediment or "silt" passing a particular measuring point on a stream is contributed by the source areas of the tributary watersheds and channels. In dealing with the matter of sediment control it is necessary, therefore, to give appropriate consideration to the stabilization of the critical sediment source areas. In many watersheds, sheet erosion on agricultural and range lands constitute the primary source of stream polluting sediment. In other instances most of the sediment may be derived from upland and valley gullying, stream bank erosion, channel deterioration, as associated with changes in land use from agricultural to urban area development, highway construction etc.

Under the Watershed Protection and Flood Prevention Act, Public Law 566, 83rd Congress, as amended, and various other enabling legislation, the U. S. Department of Agriculture is authorized to engage in activities and programs for the prevention of erosion, floodwater, and sediment damages and for the conservation, development, utilization, and disposal of water in the interest of preserving and protecting the Nation's land and water resources. Programs and activities for erosion control, both from the standpoint of on-site benefits and for the reduction of downstream sediment damages, have been long established within the Department of Agriculture.

The Agricultural Research Service is the Department agency designated to carry out necessary research in support of agricultural land and watershed development. The U.S.D.A. Sedimentation Laboratory is the principal Department facility for sedimentation research. The program of research at the Laboratory is comprehensive, encompassing consideration of all factors involved in the erosion-sedimentation sequence. Those aspects of the Sedimentation Laboratory program of special interest from the standpoint of sediment as a pollutant include:

(1) Basic studies of the factors affecting sediment detachment, transportation, and deposition;

(2) Sediment yields in relation to watershed characteristics and climatic factors;

(3) Effects of land use and conservation measures upon sediment yields;

(4) Development of methodology for predicting long-term sediment yields from agricultural watersheds;

(5) Investigations of the processes of reservoir sedimentation;

and

(6) Development of instrumentation necessary to accurately measure and evaluate sediment quantities and detrimental effects with time.

In addition to the studies at the U.S.D.A. Sedimentation Laboratory, the Agricultural Research Service, Soil and Water Conservation Research Division, conducts research on erosion and sedimentation processes, to varying degrees of intensity, in each of its seven regional Branches. And this particular area is what we call our corn belt branch. Results of this research and that at the U.S.D.A. Sedimentation Laboratory are applicable in the study and control of "silt" pollution problems.

In summary, an important consideration nationally in pollution control is the reduction and correction of the detrimental effects associated with sedimentation or "siltation". The soil and water conservation programs of the United States Department of Agriculture include sediment control as a major item and therefore are necessarily concerned with pollution abatement plans. The ever-increasing number of watershed flood prevention and conservation programs and the research activities designed to provide criteria, procedures, and guides in conjunction with these programs will have a significant effect and contribute measurably to study and correction of pollution problems. The pollution of our streams, lakes, harbors, and water-oriented developments is of serious concern to everyone and it is necessary for all agencies to give full consideration to this problem in planning and moving forward with programs involving the use and development of our water resources.

Thank you.

(Applause)

THE CHAIRMAN: Thank you. Are there any comments or questions? Thank you, Mr. Miller. Mr. Poston.

MR. POSTON: Mr. Donald G. Eddy, of the Office of Emergency Planning has a statement to make. Mr. Donald Eddy is no relation to Mr. Gerald E. Eddy, our conferee.

STATEMENT OF DONALD G. EDDY, EXECUTIVE OFFICE OF THE PRESIDENT, OFFICE OF EMERGENCY PLANNING

MR. DONALD EDDY: In fact, I have been very interested in meeting Mr. Eddy, and I did have the opportunity this morning. We are both from Lansing, by the way, and every now and then I get inquiries as to his whereabouts and he probably does the same.

Office of Emergency Planning is a small agency within the Executive Office of the President. A primary function of the Office of Emergency Planning is to advise and assist the President in determining the policy for planning, directing and coordinating the total non-military defense effort of the nation, and to assist in this we have eight regional offices. I am from the Area IV office. Area IV consists of Michigan, Indiana, Illinois, Wisconsin, and Michigan.

An essential element of our planning concerns the provision of adequate and safe supplies of water for essential purposes in an emergency; state and local government studies of the water problem which might face them following a nuclear attack, and definite emergency plans and organization to meet this action.

In your discussion of water pollution we urge you to consider not only immediate or apparent problems, but also to consider the very real threat of nuclear devastation. Consider the measures necessary to reduce vulnerability of water supplies develop a master plan for emergency repair of facilities; provide for availability of adequate stand-by power, and an inventory of chemicals and other essential supplies; explore the economic feasibility and practicality of creating additional sources of ground water to replace these contaminated water supplies.

We are appreciative of the opportunity to participate in this conference and we realize and know you will recognize the importance of your emergency planning responsibilities.

I do thank you for this opportunity.

THE CHAIRMAN: Thank you.

(Applause)

MR. POSTON: I think we have called on all of the Federal agencies who have indicated a desire to appear. If there are others here who have not been called upon and would like to make a statement, I would like to hear from them at this time.

I think that ends the presentation.

THE CHAIRMAN: That was very full and complete. I have just a few short announcements. There is a postcard here from a Howard O. Allerding of Detroit, which I would like to put in the record without objection.

(The postcard referred to is as follows:

2/24/62. Sir: Lake Huron is also polluted -- fish by millions have covered the beach for past 2 years on Canadian side of Lake Huron (Grand Bend, Ipperwash Provincial Park, etc.)

Sincerely, Howard O. Allerding, 8144 Lauder St., Detroit 28, Mich.)

THE CHAIRMAN: I also have a telegram from Mrs. Beatrice J. Waterbury, of the Northwestern Ohio Natural Resources Council of Toledo, Ohio which I would like to put in the record at this point.

(The telegram is a follows:

"Western Union Telegram 1962 Mar 27
347P EST MAR 27 62 DEC254
SSD434 DE TOA360 DL PD TOLEDO OHIO 27 324P EST
MURRAY STEIN, CHAIRMAN US DEPT OF HEALTH
EDUCATION & WELFARE
VETERANS MEMORIAL BLDG
151 WEST JEFFERSON AVE DET

THE UNDERSIGNED ORGANIZATION REPRESENTS SOME THIRTY LOCAL GROUPS CONCERNED WITH CONSERVATION OF OUR NATURAL RESOURCES SORRY WE CANT BE PRESENT AT YOUR CONFERENCE BUT YOU CAN COUNT ON OUR COOPERATION WITH ANY CONSTRUCTIVE PROGRAM OF POLLUTION ABATEMENT. GLAD YOU ARE SPONSORING THIS CONFERENCE. PLEASE LET US KNOW OF CONCLUSIONS REACHED. WE WILL APPRECIATE NOTICE OF FUTURE AREA CONFERENCES

NORTHWESTERN OHIO NATURAL RESOURCES COUNCIL MRS BEATRICE J WATERBURY PRES GINGER HILLS LANE TOLEDO 1 OHIO.")

THE CHAIRMAN: As was announced earlier those who feel they can still concentrate on the Detroit River problem are invited to watch the movie of a helicopter trip which will be shown now. We will reconvene promptly at nine o'clock tomorrow. I ask you all to come in order to get a balanced picture of what we have done today. We have heard from the Federal people, from the Federal representatives of various agencies including our own. Tomorrow you will hear from the State people and all the people that the State has invited. I do not think that this problem can be put into perspective until we have heard all who wish to make statements on the matter.

With that we will stand adjourned until nine o'clock tomorrow. Thank you for coming.

(Whereupon at 4:20 o'clock p.m. the conference was recessed until 9:00 o'clock a.m. the following day, Wednesday, March 28, 1962.)